

Dual

Dual 1218 Service Manual

Edition April 1971



Technical data

| | |
|---|---|
| Power source: | alternating current, 50 or 60 Hz, depending on choice of interchangeable motor pulley |
| Supply voltage: | 110, 117 or 220 volts, switchable |
| Drive system: | 4-pole, split-pole synchronous motor with radially located elastic mounts. Transmission to turntable platter via highly wear-resistant, compliant idler wheel |
| Power consumption: | 10 watts approx. |
| Current consumption: | at 220 volts, 50 Hz, approx. 64 mA at 117 volts, 60 Hz, approx. 115 mA |
| Turtable platter: | non-magnetic, 1.8 kg (4 lb), 270 mm (10.5 in.) diameter Moment of inertia: 1.9 • 10.5 gram cm/sec |
| Turtable speeds: | 33 1/3, 45 and 78 rpm |
| Pitch adjustment range: | 6 % on all three speeds. (approx. 1 musical semitone) |
| Speed variation: | $\leq \pm 0.09\%$ according to DIN 45 507 |
| Rumble and other noise: | unweighted, ≥ 40 dB } weighted, ≥ 57 dB } according to DIN 45 500 |
| Tonearm: | torsionally rigid metal arm, in 4-point gimbal suspension, with skeletal head design |
| Cartridge holder: | removable accepts all types of cartridges weighting between 1 and 12 grams and having internationally standard 1/2" mounting centers |
| Maximum tracking error: | $\leq 0.18^\circ/\text{cm}$ |
| Weight: | 4.9 kg (10 3/4 lb) less packing |
| Mounting dimensions and mounting-board cut-out: | obtainable from mounting instructions |

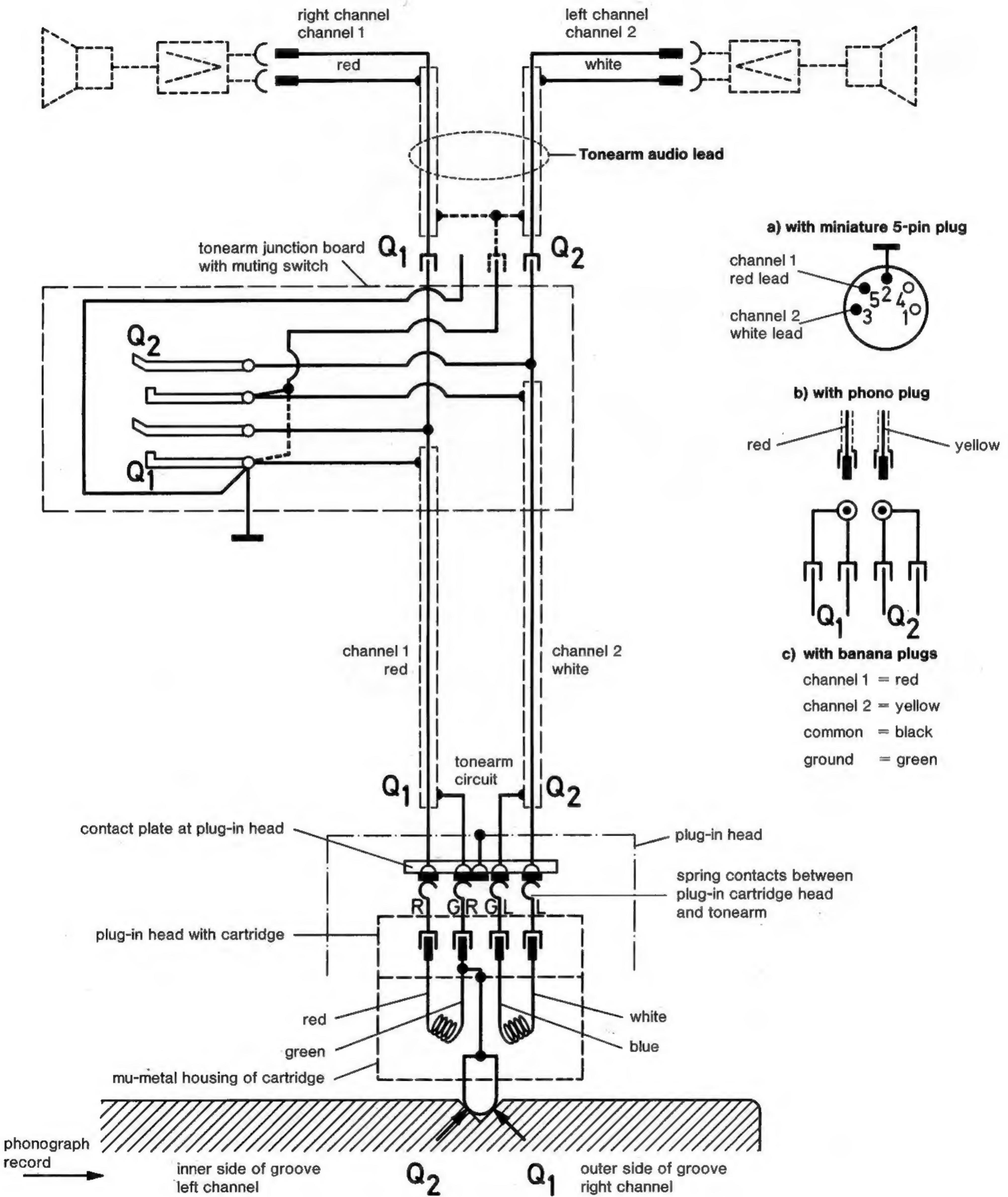
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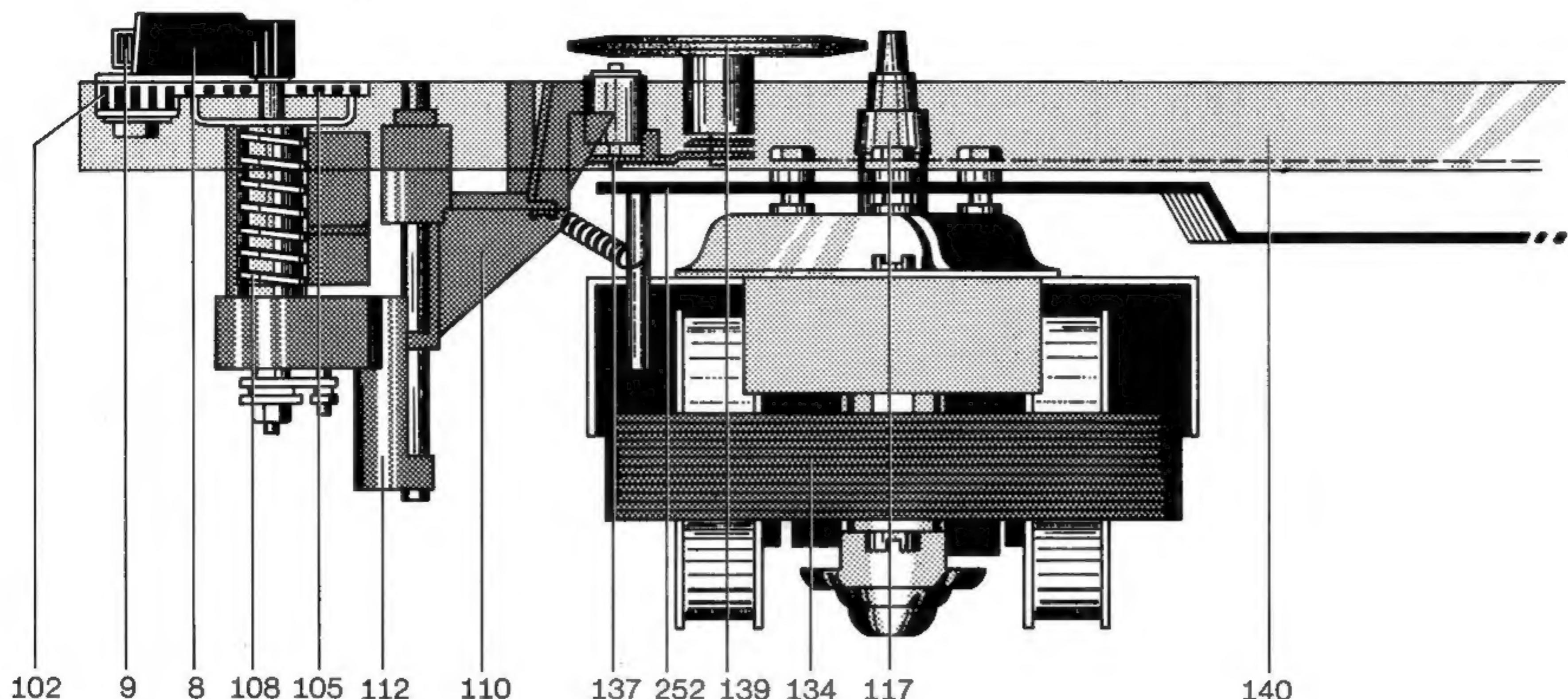
Fig. 1 Tonearm hookup schematic



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Fig. 2 Motor suspension and turntable drive



Motor and drive

Power for the turntable platter and the changing mechanism is supplied by a four-pole, split-pole synchronous motor suspended by radially located elastic mounts and having a very small stray magnetic field as well as little vibration.

The speed of the motor is independent of line-voltage, temperature or load variations. Speed is dependent on, and proportional to, power-line frequency. The motor is adapted to 50 or 60 cycle (Hz) power-line frequencies by the correct choice of the motor pulley.

Motor pulley for 50 Hz operation:
part no. 218 273

Motor pulley for 60 Hz operation:
part no. 218 274

The motor pulley is fastened to the motor shaft by a setscrew. When you change pulleys, be sure that the new pulley is set at the correct height (see page 5).

The turntable platter is driven by the idler wheel (139) which, to prevent damage to its friction surfaces, is automatically disengaged when the unit is shut off. Setting the turntable speed to 33 1/3, 45 or 78 rpm is done by raising or lowering the idler to bear against the proper step of the motor pulley.

Upon actuation of the switch (8), the switch segment (107) rotates. This causes the lever (110) fitted into a slot on the segment to move vertically. The drive wheel (139) carried on the swinging arm (137) is then lifted off the motor pulley and moved and replaced on the motor pulley step corresponding to the selected speed.

Fig. 3 Motor field connections
(with voltage selector)

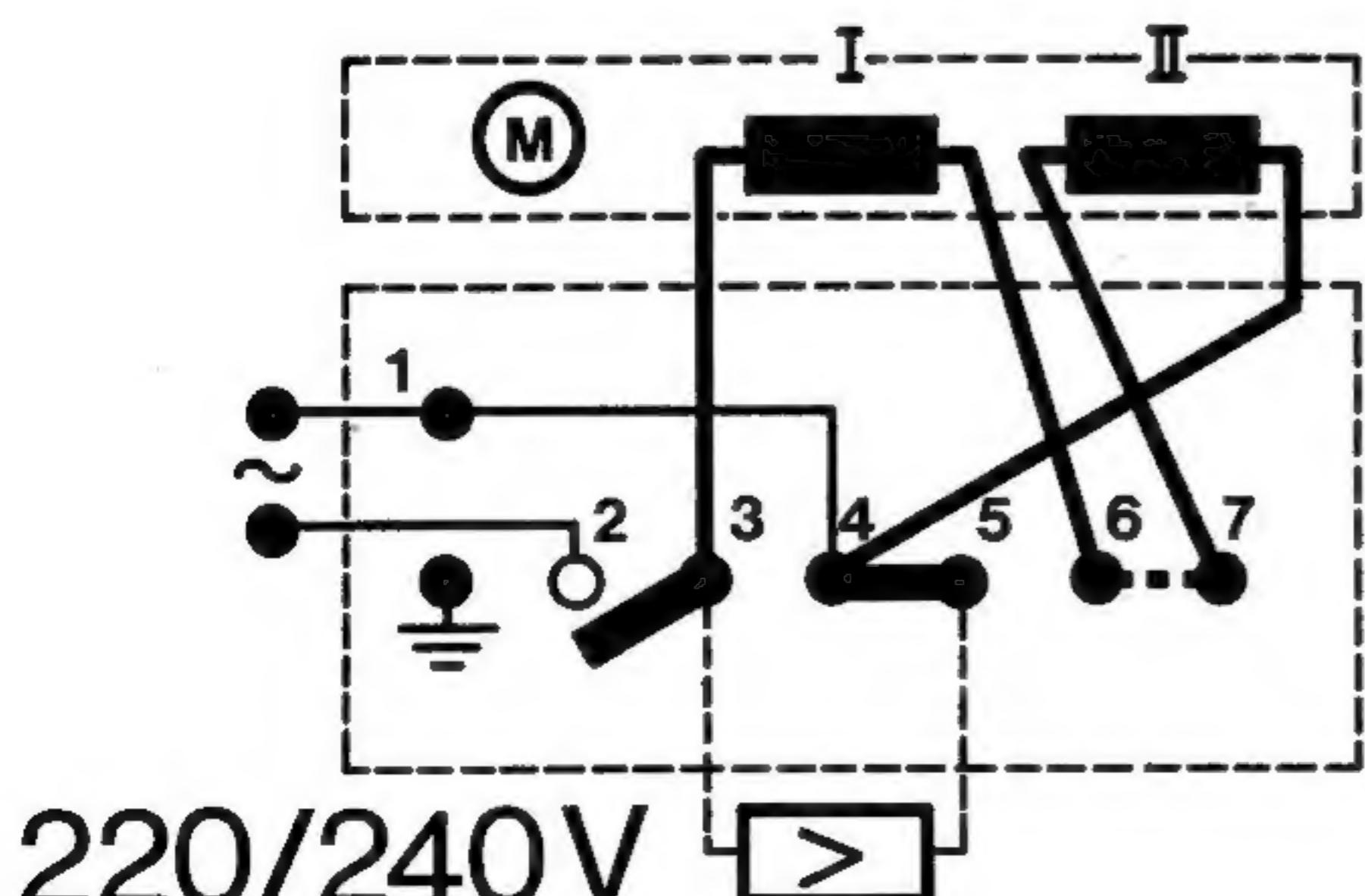
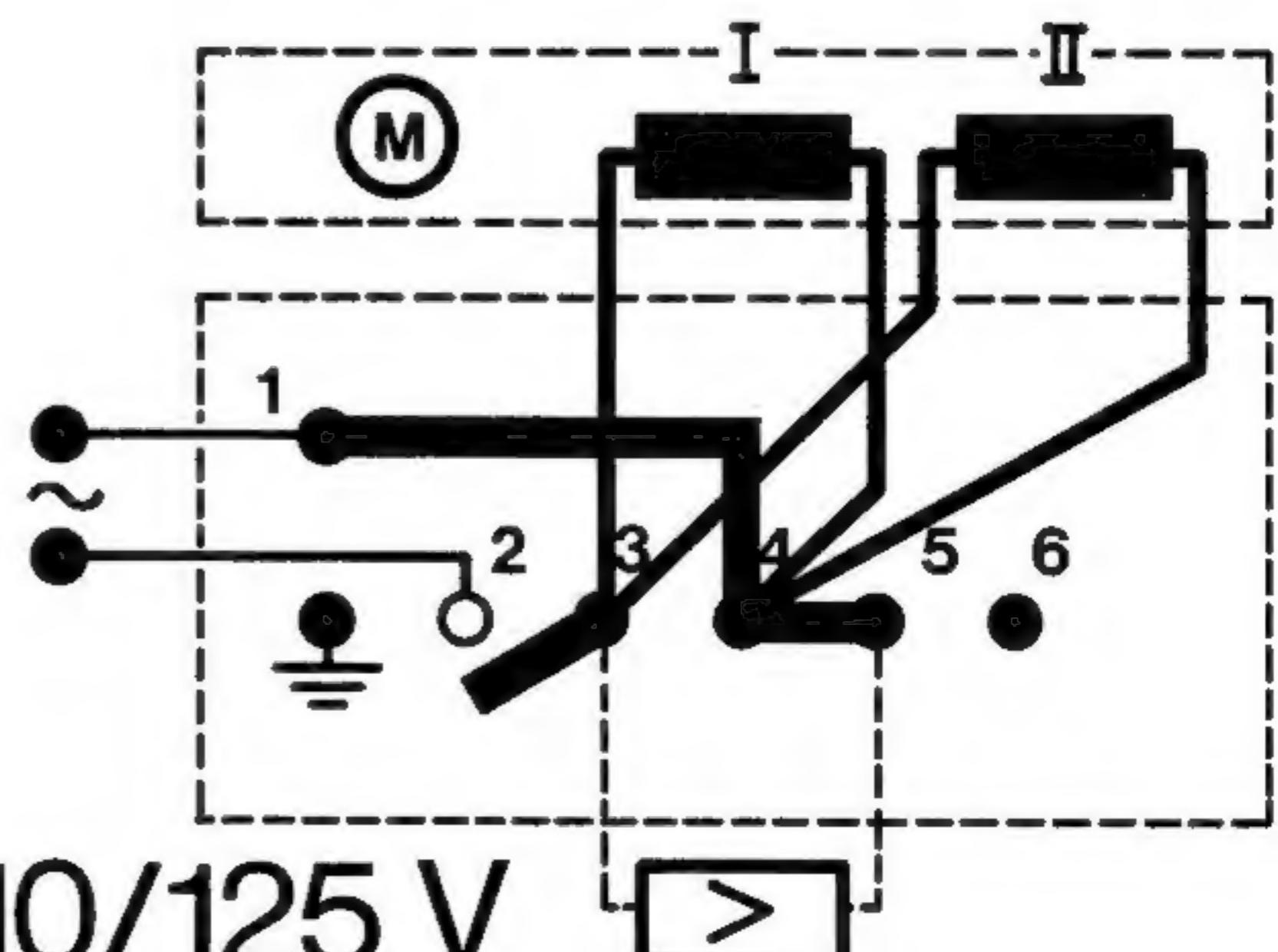


Fig. 4 Motor field connections
(less voltage selector)

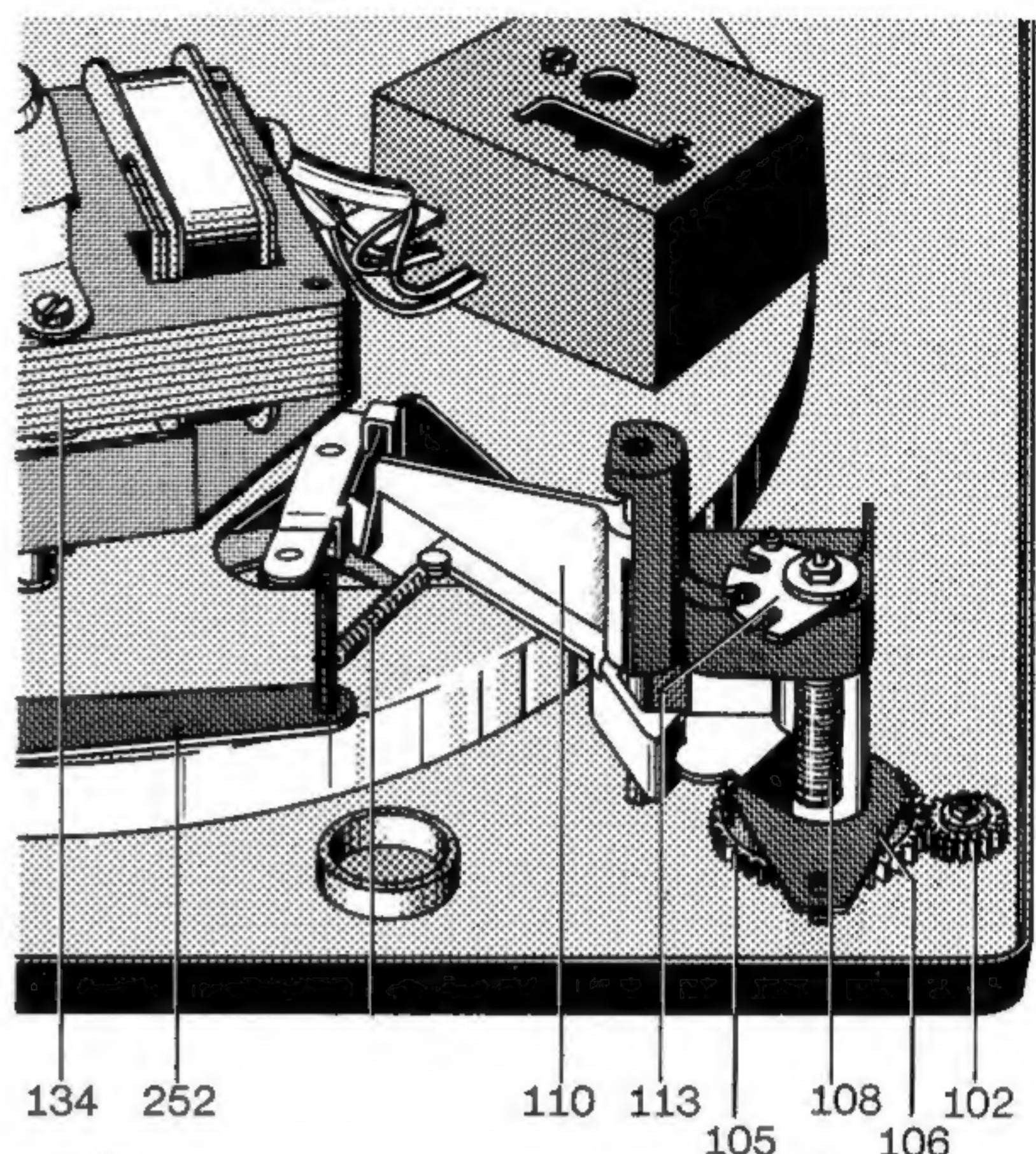


Fine-speed adjustment

A fine speed adjustment for all three speeds permits a platterspeed variation of 6 % (about 1 semitone).

Turning the pitch-control knob (9) causes the selector segment (107) to rotate. The switch lever assembly (110) moves up and down, changing the position of the idler wheel on whatever motorpulley step it has been placed on. The tapered shape of the motor pulley gives an adjustment range of $\pm 3\%$ from the nominal speed.

Fig. 5 Turntable speeds and drive wheel shift mechanism



| Symptom | Cause | Remedy |
|--|---|---|
| Turntable does not run when unit is plugged in and start switch operated | a) Current path to motor interrupted b) Idler wheel (139) not in contact with platter c) Motor pulley loose | a) Check connection at switch plate and voltage selector b) Check switch lever assembly (110) c) Tighten motor pulley |
| Turntable does not come up to speed | a) Motor pulley is not correct for local line frequency b) Slippage between idler wheel (139) and motor pulley or platter c) Excessive friction in motor, drive wheel or platter bearings | a) Change motor pulley b) Clean friction surfaces of idler wheel, motor pulley and turntable platter. If necessary, replace drive wheel. Once the drive surface of the platter has been cleaned, do not touch it with your fingers. c) Clean and oil bearings |
| Rumble in reproduction | Worn idler wheel | Replace idler wheel (139) and clean platter drive surface and motor pulley with greaseless solvent. Once surfaces are cleaned, do not touch them with your fingers. |

Symptom

Correct nominal speed obtained only at extreme settings of pitch control

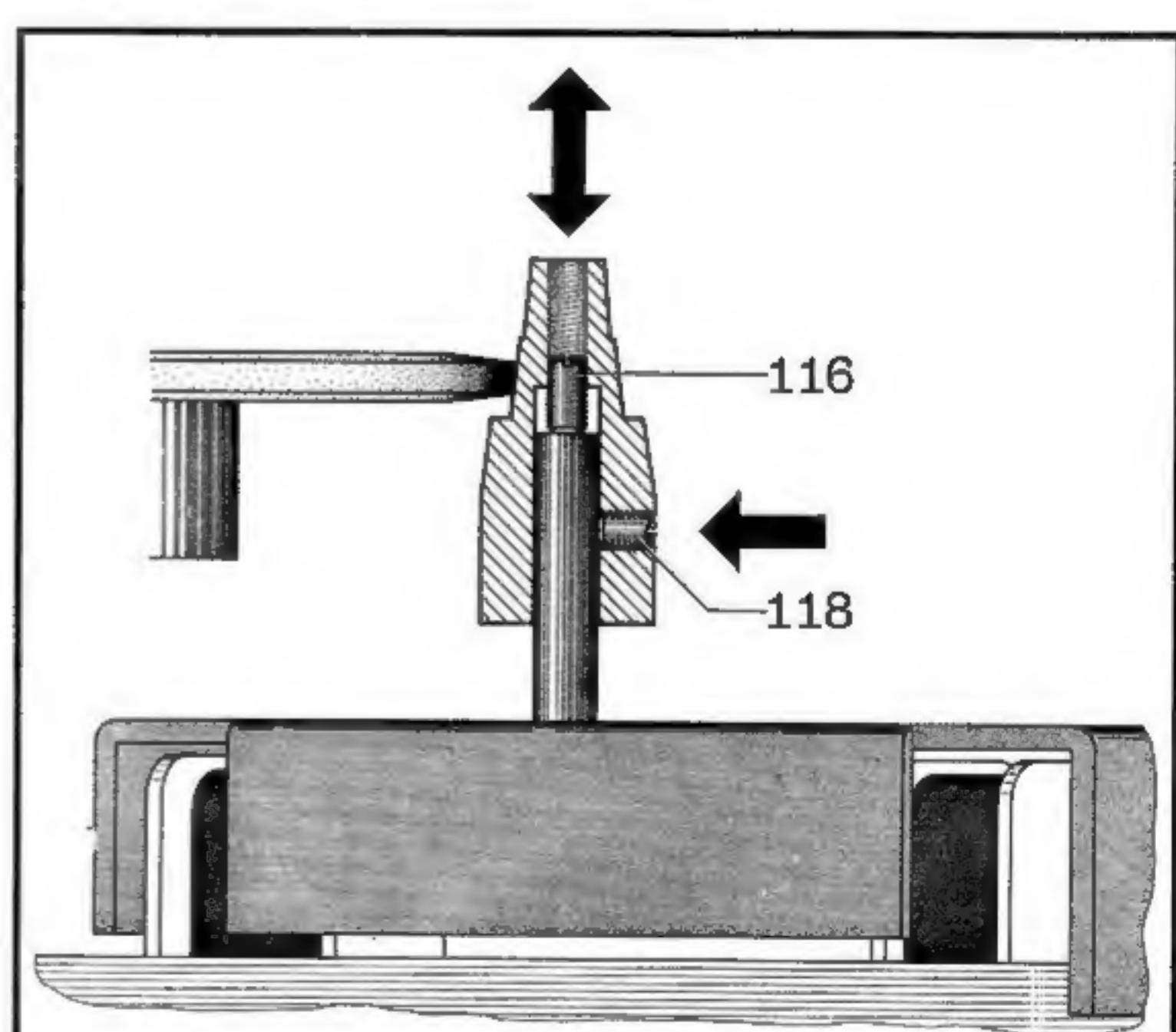
Cause

Idler wheel does not contact motor pulley correctly

Remedy

Adjust the motor pulley vertically after loosening its setscrew (116). Or adjust the idler wheel (139) by turning its shaft after loosening the locknut. The correct position for the idler is in the center of each motor pulley step, when the pitch control is centered in its range. Retighten locknut after adjustments.

Fig. 6 Motor pulley position



Tonearm and tonearm bearing

The Dual 1218 has a light, torsionally rigid metal tonearm in a gimbal-type suspension. The actual support is provided by four hardened and precision-polished steel points resting in precision ball bearings. Tonearm pivot friction is thus reduced to a minimum.

Vertical pivot friction 0.01 gram
Horizontal pivot friction 0.02 gram
referred to stylus tip

It therefore guarantees exceptionally good tracking characteristics. The tonearm head is removable. Before setting the correct stylus force for the particular cartridge installed in the tonearm head, the tonearm should be balanced with the stylus force setting dial at the zero position. Coarse balancing is accomplished by sliding the counterweight (50) and using setscrew (51), after which a fine adjustment is made by turning the weight. The counterweight is proportioned so that cartridges with a weight of from 1 to 12 grams can be balanced. For the absorption of vibration and rapid small shocks, the counterweight is coupled to its threaded shaft through an

Fig. 7 Tonearm bearing assembly

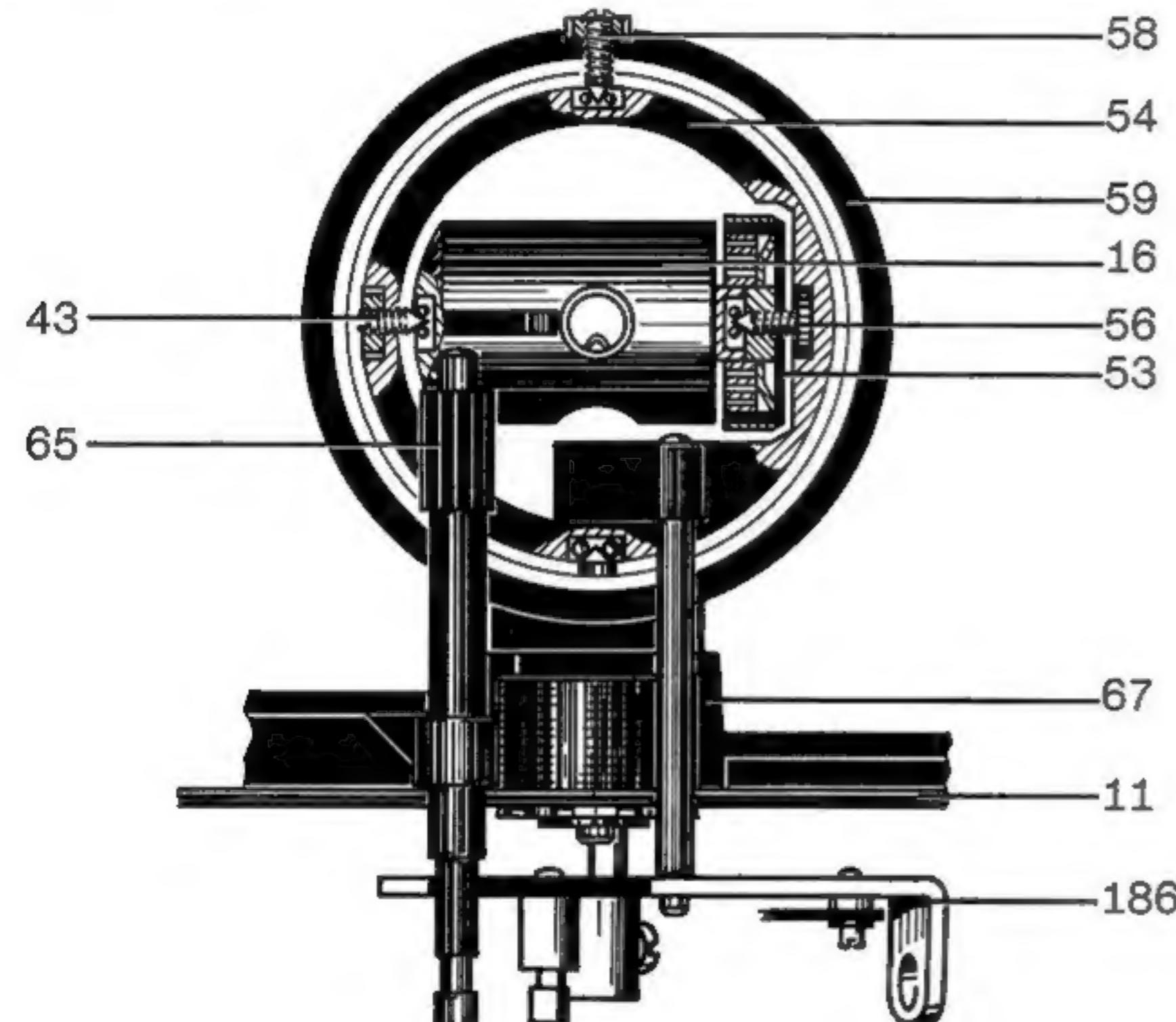
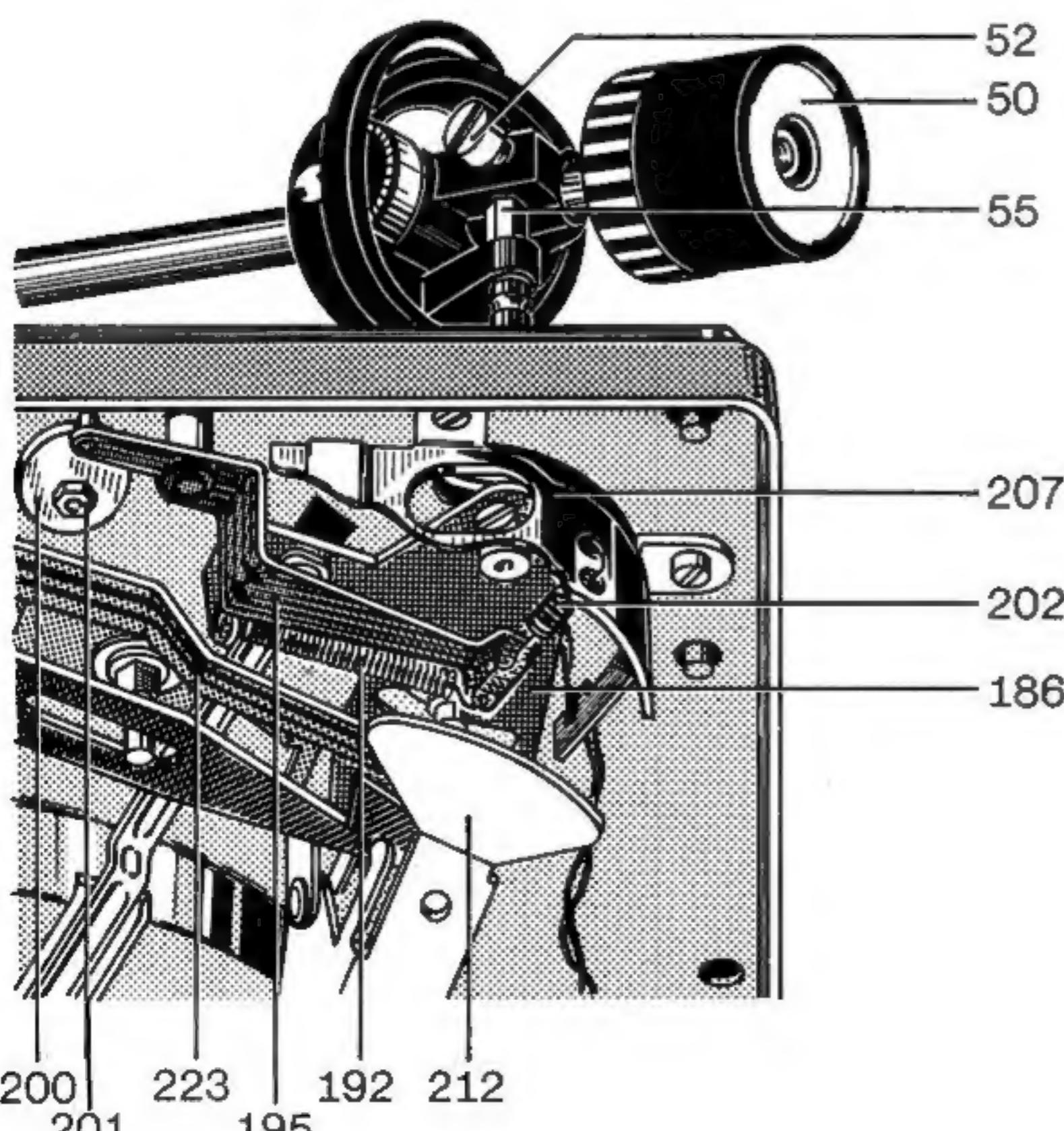


Fig. 8 Tonearm bearing assembly (under view)



elastic medium, and braked to prevent unintended rotation. The tonearm head accommodates all cartridges that conform to the internationally standard 1/2 inch mounting centers, and whose weight does not exceed 12 grams. Stylus force is set by turning spring housing (53), which is equipped with calibrations and which stresses or relaxes a spiral spring inside it. The scale is calibrated for a range of zero to 5.5 grams, and permits exact settings every 0.25 gram within that range.

To replace the tonearm complete with tonearm bearing, the following procedure is recommended:

1. Fasten complete unit in repair jig. Set stylus force to zero and lock tonearm.
2. Turn unit upside down and unsolder tonearm leads.
3. Remove main lever (212) and linking lever (223).
4. Unhook tension springs and unscrew protective cover.
5. Unfasten C-washer (196) and remove skating lever.
6. After loosening C-washer (247) and friction washer (246) separate shutoff slide (248) from segment (186).
7. Loosen cylinder screw (197) and remove segment (186).
8. Take off C-washer (62), underlying washer (61), and curved safety washer (60) or safety spring, and remove tonearm.

When replacing the tonearm and bearing assembly, follow the procedure in reverse. The unit is first in the upright position. Insert the tonearm and lock it. Turn unit upside down, and insert curved safety washer (60), underlying washer (61) and C-washer (62), or safety spring. When reinstalling the protective cover (207), be sure that the segment (186) can move without hindrance through the tonearm leads.

To remove the tonearm from the bearing ring, after unsoldering the tonearm leads set the stylus force dial to zero. Unscrew locknut (42) with threaded rod (43) and bearing screw (56) (left-hand thread). Take tonearm carefully out of the bearing ring. For adjusting the tonearm head, a hole is provided in the chassis to make this possible without first removing the tonearm.

Both bearings afford a small, barely noticeable play. Adjustment of the vertical bearing should be undertaken only at the left screw (threaded rod 43), and of the horizontal bearing at threaded rod (58). The horizontal tonearm bearing is correctly set when, at an antiskating setting of "0.5" (tonearm previously exactly balanced), the tonearm glides smoothly from inside (center) to outside without binding.

Anti-skating adjustment

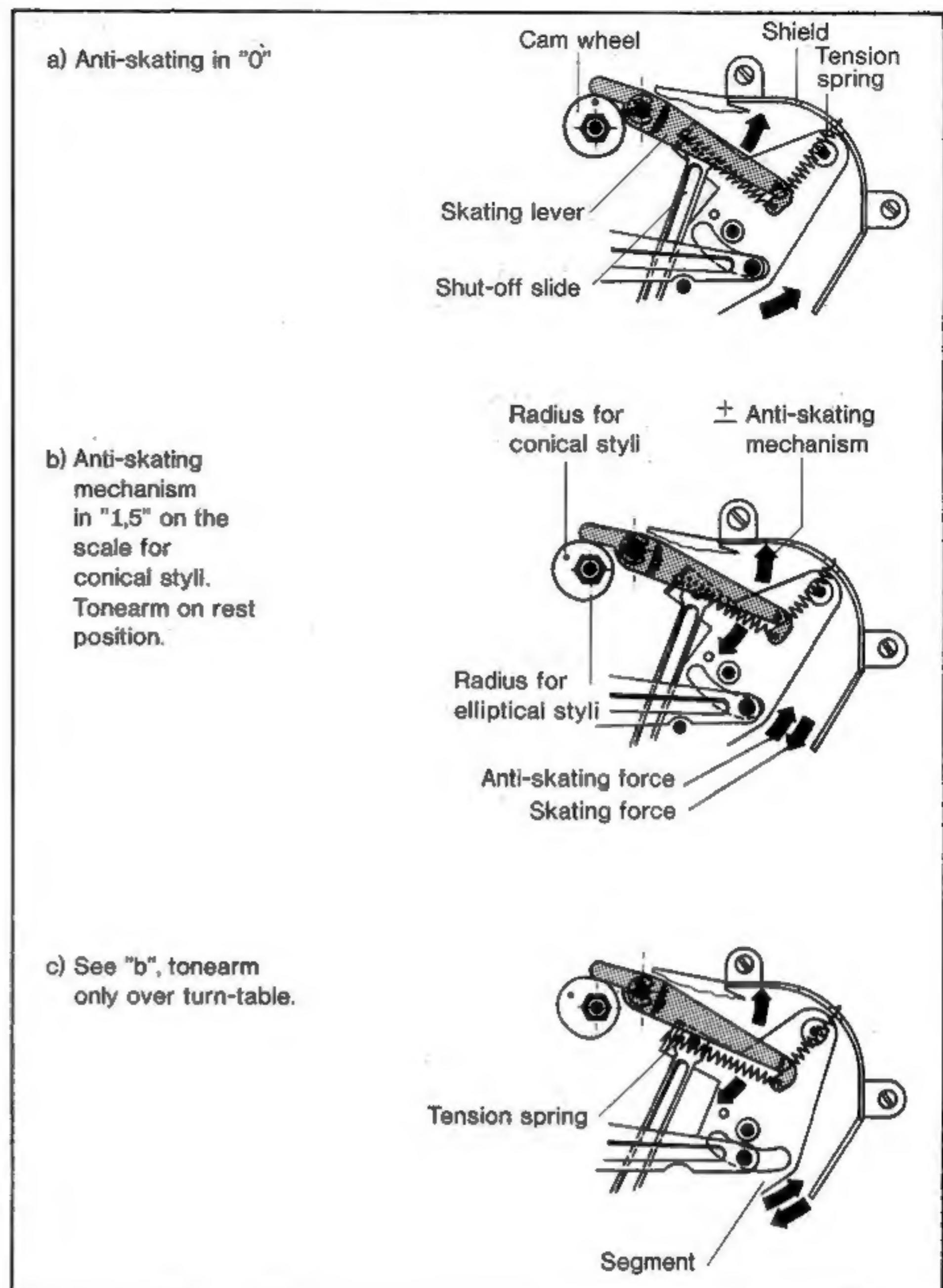
The tendency of a tonearm with an offset (angled) head to "skate" inward across the record is eliminated in the Dual 1218 by a precision anti-skating mechanism.

Skating force depends on tonearm geometry, stylus force and the tip radius of the stylus. The inward pull on the tonearm caused by the skating effect gives rise not only to an undesirable jumping of the tonearm when it is set down on the record, but also to unequal forces on the two opposite groove walls, with corresponding ill effects. This can be corrected with proper anti-skating adjustment.

By turning the anti-skating adjustment knob (66) on the chassis, an asymmetrical curved washer (200) is turned. This washer has two different curved surfaces corresponding, respectively, to the red and black scales on the anti-skating dial. The red scale is for conical (spherical-tip) styli; the black for elliptical (bi-radial) styli. When the knob is turned, the curved surfaces push the anti-skating lever (195) away from its rest position so that it applies a suitable counterforce via a spring (192).

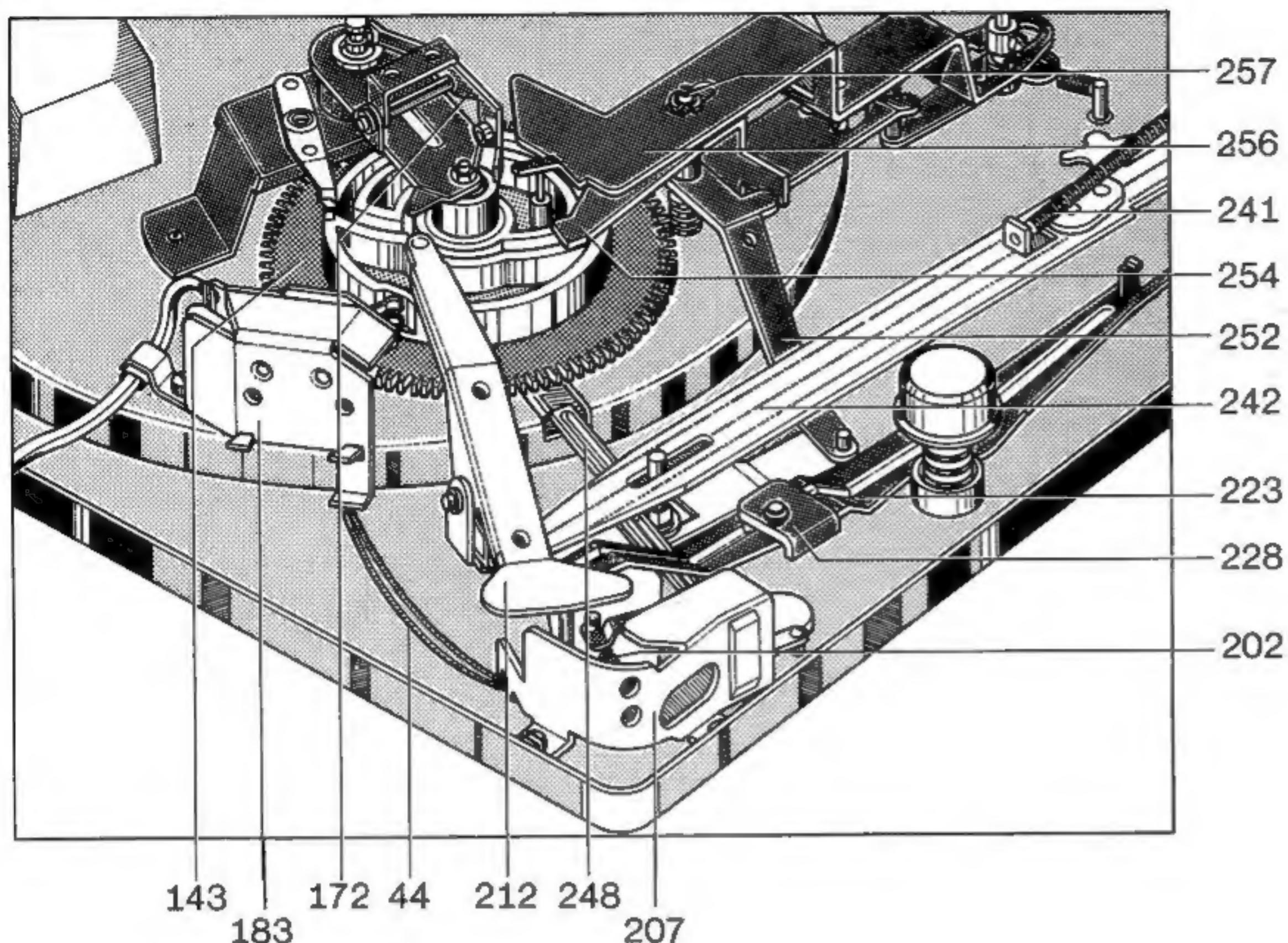
Skating compensation is set at the factory for conical styli with a tip radius of 0.6 to 0.7 mil (.0006 - .0007 inch), and for elliptical styli with measurements of 0.20 to 0.23 mil by 0.79 to 0.87 mil. The hex adjusting nut is tightened and sealed. Readjustments should be attempted only with the help of the Dual Skate-o-meter and test record L 096. This work is best done by an authorized Dual service agency.

Fig. 9 Anti-skating



| Symptom | Cause | Remedy |
|---|---|---|
| Stylus skips | a) Tonearm not balanced b) Stylus force too low c) Anti-skating wrongly adjusted d) Stylus worn or chipped e) Excessive friction in tonearm bearing f) Ball (249) missing from shut-off rail | a) Balance tonearm b) Check tonearm balance, set stylus force to value recommended by cartridge manufacturer c) Correct antiskating setting d) Replace stylus e) Check tonearm pivot. Should have barely noticeable play. Adjust vertical bearing only with the left bearing screw (43) and the horizontal bearing with nut (58). Horizontal bearing is correctly adjusted when the tonearm, with anti-skating set at 0.5 gram, swings freely from center to rest. f) Replace ball (249) |
| Vertical movement of tonearm is impeded during set-down cycle | a) Bearing friction too high b) Lift bolt (193) jams in guide tube (or sleeve). | a) Check bearing screw (43) and arm balance b) To remove tonearm complete with bearing assembly (described on page 6). Remove pimpel (63) on lift bolt (193), remove C-washer (64) and positioning socket, and second C-washer (49). Lift out lift bolt. Clean lift guide tube and lift bolt. Coat lift bolt uniformly with "Wacker Silicon Oil AK 300 000". |

Fig. 10 Tonearm guide mechanism



Tonearm movements

A guide groove located on the underside of the main cam (143) controls the automatic lift and set-down of the tonearm as the cam rotates through 360°. Tonearm lift and lowering are controlled

by the main lever (212) and the lift screw (193). Horizontal movements are controlled by the main lever (212) and the segment (186). Setting the changer for playback of 7", 10" or 12" discs is done with the indexing lever (46). Setdown points are determined by the eccentric portion of the arm positioning slide (242) and the indexing lever (240).

Horizontal movement of the tonearm is limited by the arm segment striking the arm positioning slide (242). During the change cycle, the main lever (212) raises the arm positioning slide, bringing it within reach of the spring stud. On completion of the change cycle (set-down of the tonearm on the record), the arm positioning slide (242) is again released and returns to its normal position. It thus moves out of reach of the spring stud, permitting the tonearm to move horizontally without hindrance, while playing the record.

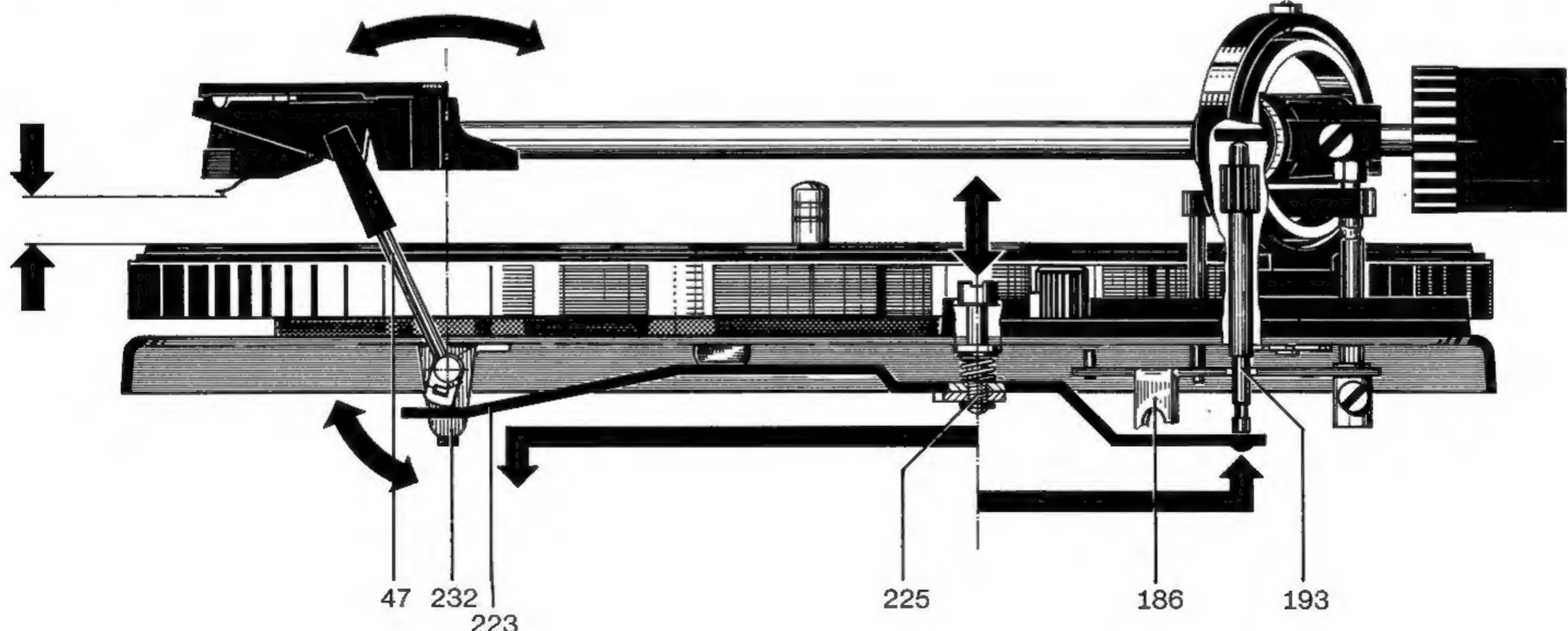
Tonearm lift (Cue control)

The tonearm lift permits the tonearm to be set down on the record safely at any desired point except the shut-off area (near the record label). Pulling the tonearm lift towards the front turns the drive washer (238). This moves the connecting lever (223), and lift screw (193) to raise the tonearm.

After the tonearm is moved (by hand) to the desired spot on the record, the tonearm lift handle is lightly tapped towards the rear to release the mechanism. The connecting lever

(223) and the leaf spring (190) of the lift screw (193) are freed, allowing the tonearm to fall. The rate of fall is controlled by silicone oil in the lift tube. The height of the stylus above the record can be varied by adjusting setscrew (225). Turning it to the right increases the height, turning it to the left decreases the height. In any case, units leaving the factory are adjusted so that the tonearm lifted off the fifth record on the platter.

Fig. 11 Tonearm lift (tonearm raised)



| Symptom | Cause | Remedy |
|---|---|---|
| Tonearm misses edge of record | a) Set-down incorrectly adjusted b) Record not standard size c) Friction surfaces of tonearm clutch dirty | a) Adjust set-down with a 12" record so that stylus touches record approximately 1/16" inside edge of record. Adjustment will be correct for other sizes. b) Use standard records c) Clean clutch surfaces |
| Tonearm does not move on to record when drop cycle is started | Damping too great; drive washer dirty | To remove tonearm complete with bearing assembly (described on page 6). Remove pimpel (63) on lift bolt (193), remove C-washer (64) and positioning socket, and second C-washer (49). Lift out lift bolt. Clean lift guide tube and lift bolt. Coat lift bolt uniformly with "Wacker Silicon Oil AK 300 000". |
| Tonearm lowers too quickly when drop cycle is started | Too little damping | To remove tonearm complete with bearing assembly (described on page 6). Remove pimpel (63) on lift bolt (193), remove C-washer (64) and positioning socket, and second C-washer (49). Lift out lift bolt. Clean lift guide tube and lift bolt. Coat lift bolt uniformly with "Wacker Silicon Oil AK 300 000". |
| Tonearm returns to rest immediately after being placed on record manually | Shut-off mechanism has shifted out of position during shipping | Before using changer after moving, run it through start cycle with tonearm locked on rest. |

Start cycle

Moving the start switch (45) moves the switch lever (254) towards the main cam (143), initiating the following sequence.

- a) The set screw of the switch lever assembly (254) turns the switch arm (252) mounted on the grooved shaft (257). Via a tension spring, this actuates the rocker assembly (110) and engages the idler (139) between the platter (7) and the motor pulley (117). At the same time, the power switch (163) is actuated by the switch slide (153) through the switch arm, and the turntable begins to rotate.
- b) The switch lever (254) is brought within reach of the cam follower lever (162), so that it is pushed into the change position after the rotation of the main cam.

Moving the operating switch also releases the start lever (256), pulling it towards the main cam by means of the tension spring (255). This causes coil spring to bring the shut-off lever (157) within range of the main cam dog. Thus the shut-off lever drives the main cam.

Fig. 12 Start position

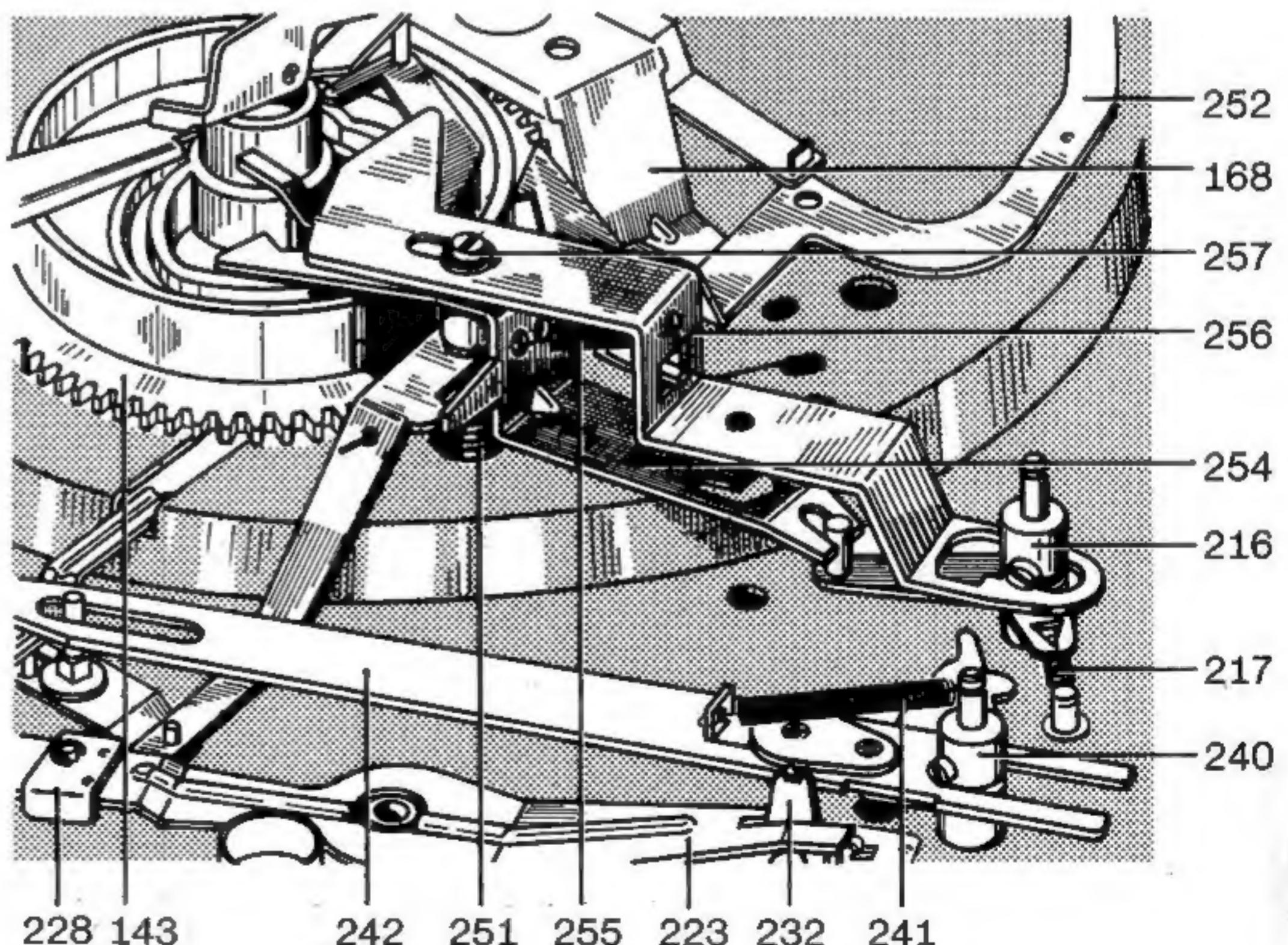


Fig. 13 Stop position

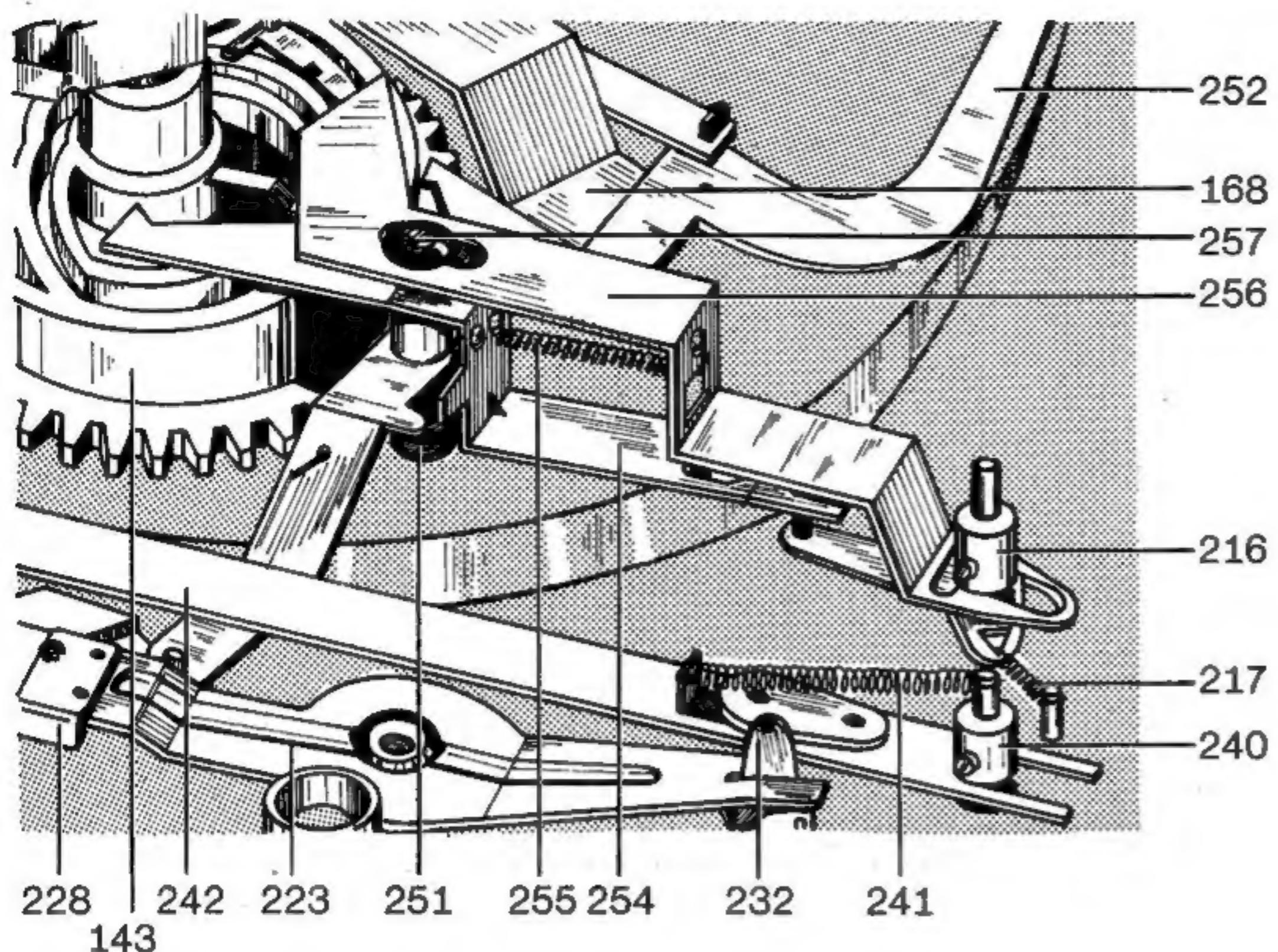
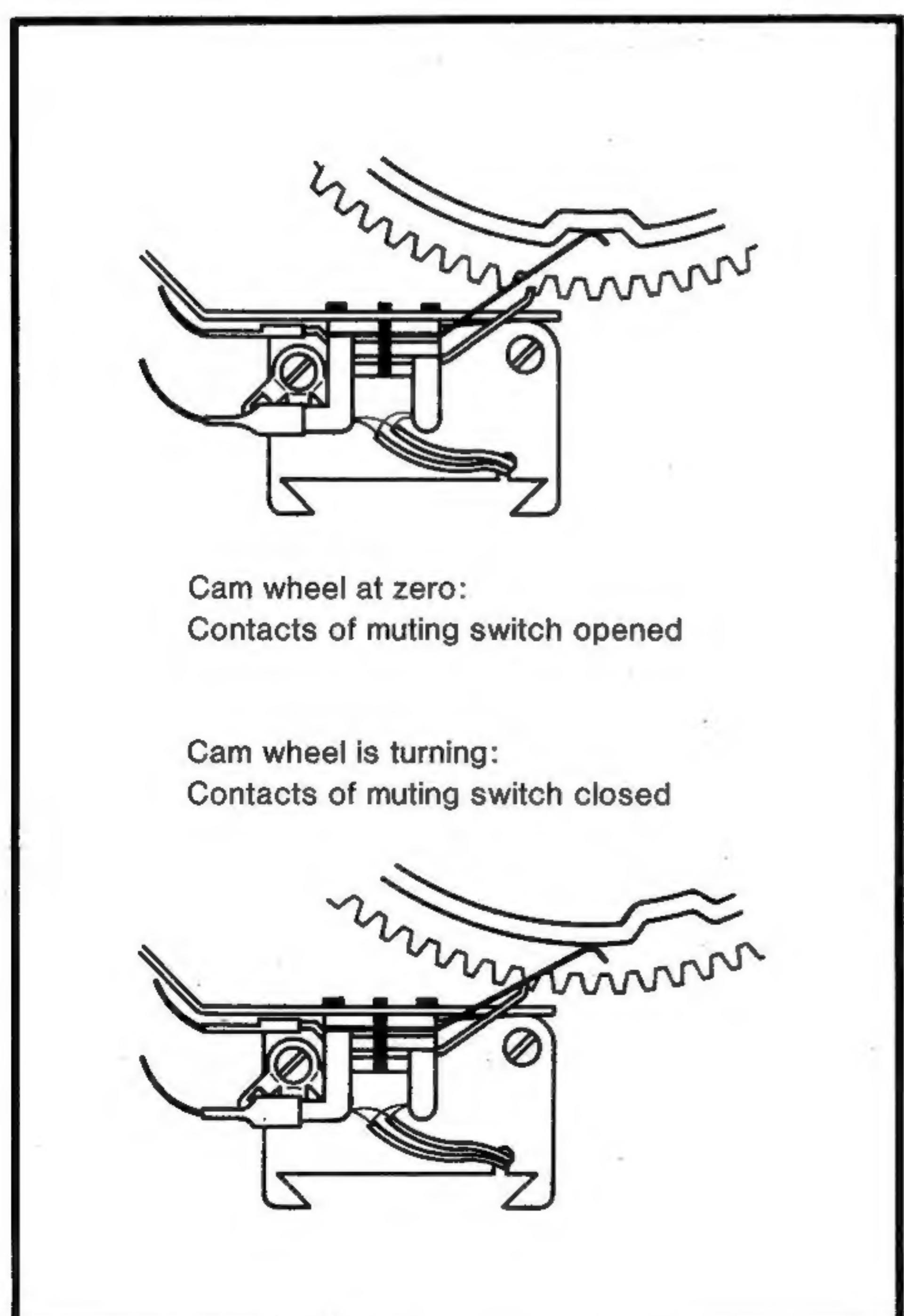


Fig. 14 Muting switch



To prevent malfunctioning, the operating switch is locked during the start cycle (that is, while the main cam is turning). Just before the main cam reaches its neutral position (at the end of the change cycle), the start lever is pushed clear of the main cam by the start pin of the main cam. This restores the switch lever and operating switch to their original positions.

After installation and also after moving the changer, the unit should be started with the tonearm locked on the rest. This will automatically re-adjust the shut-off lever, which may have shifted out of position.

Manual start

When the tonearm (15) is swung inward by hand, the pawl on the switch arm drops into a support on the base plate, holding the switch arm in this position and the idler wheel (139) in contact with the platter. The slide (153) linked with the switch arm actuates the power switch and sets the turntable platter rotating.

On reaching the run-out groove, the tonearm automatically returns to its rest position and the unit shuts itself off. (See shut-off mechanism, next side). However, if the tonearm is lifted off the record manually and returned to the rest, the tabs of the arm segment (186) release the pawl. The torsion spring (251) then returns the switch arm to its initial position, opening the power switch and disengaging the idler wheel.

Stop switching

When the operating lever is moved to "stop", the starting lever (256) is pushed forward. As a result the shut-off linkage comes into contact with the main cam. The swinging lever (162) remains in its stop position.

When the tonearm is on its rest and the operating lever is pushed to "stop", the operating lever must not jam.

Muting switch

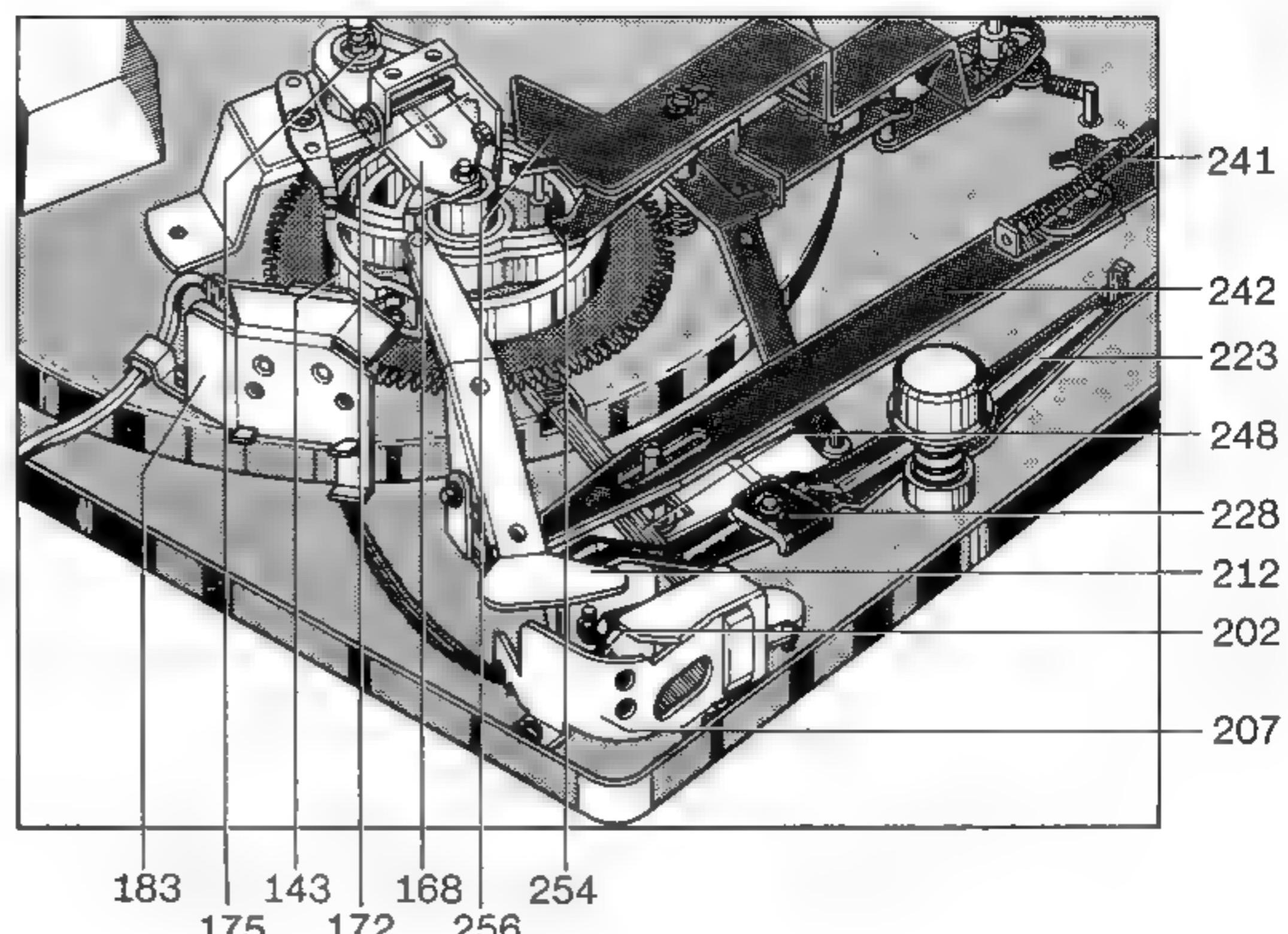
To prevent the noises of the change cycle from being sent through the audio system, the apparatus is fitted with a short-circuiting (muting) switch (183). The switch springs for both channels are actuated by the main cam (143). In the tonearm rest position, the muting switch is opened.

Record drop

Insert the appropriate spindle - AW 3 for standard records (7 mm center hole) or AS 12 for 45 rpm records (38 mm center hole).

Record-drop is initiated by the rotation of cam (143), whose cam surface guides the cam rocker (172), pushing the change actuator stud (175) and releasing a record by means of the automatic spindle. The main cam is designed so that a record can drop only when the tonearm is above the tonearm rest and thus out of the reach of the largest possible record (12" diameter).

Fig. 15 Record drop



Shut-off and change cycle

The dog (M) on the turntable platter gear (PR) and the shut-off lever (157) actuate both the change cycle at the end of the record as well as the shut-off after the last record in a stack is played.

At the end of a record, the tonearm moves towards the center at an accelerated rate due to the increased pitch of the grooves. This motion carries the shut-off lever (157) towards the dog by means of the shut-off slide (248). The eccentric dog pushes the shut-off lever (157) back at each revolution as long as the tonearm advance is only one normal record groove.

The run-out groove with its steeper pitch moves the shut-off lever against the dog with greater force, engaging the shut off-lever (157) and causing the main cam (143) to be driven out of its neutral position by the turntable platter gear.

Fig. 16 Actuating "change" or "shut-off"

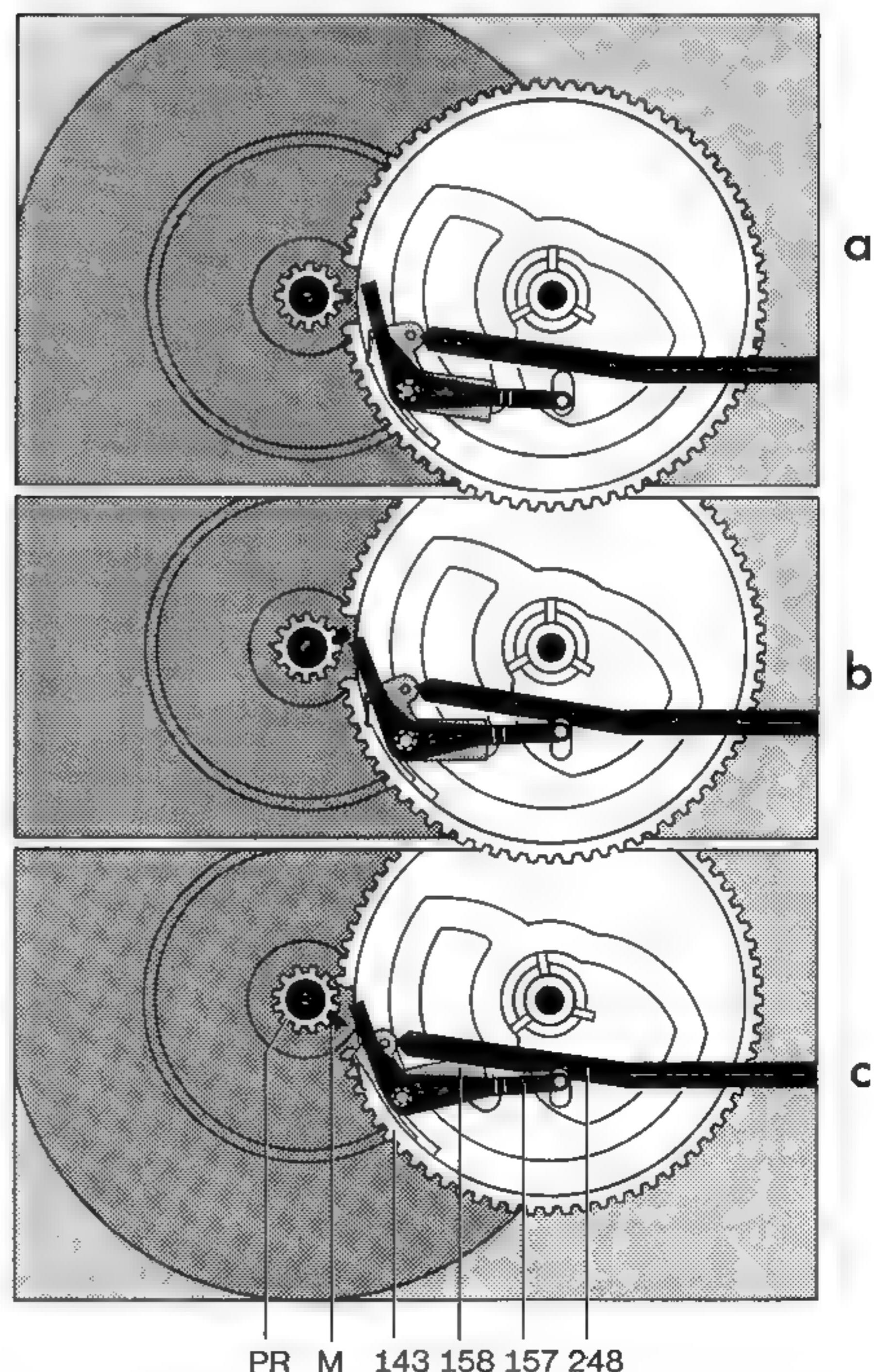


Fig. 17 Change cycle

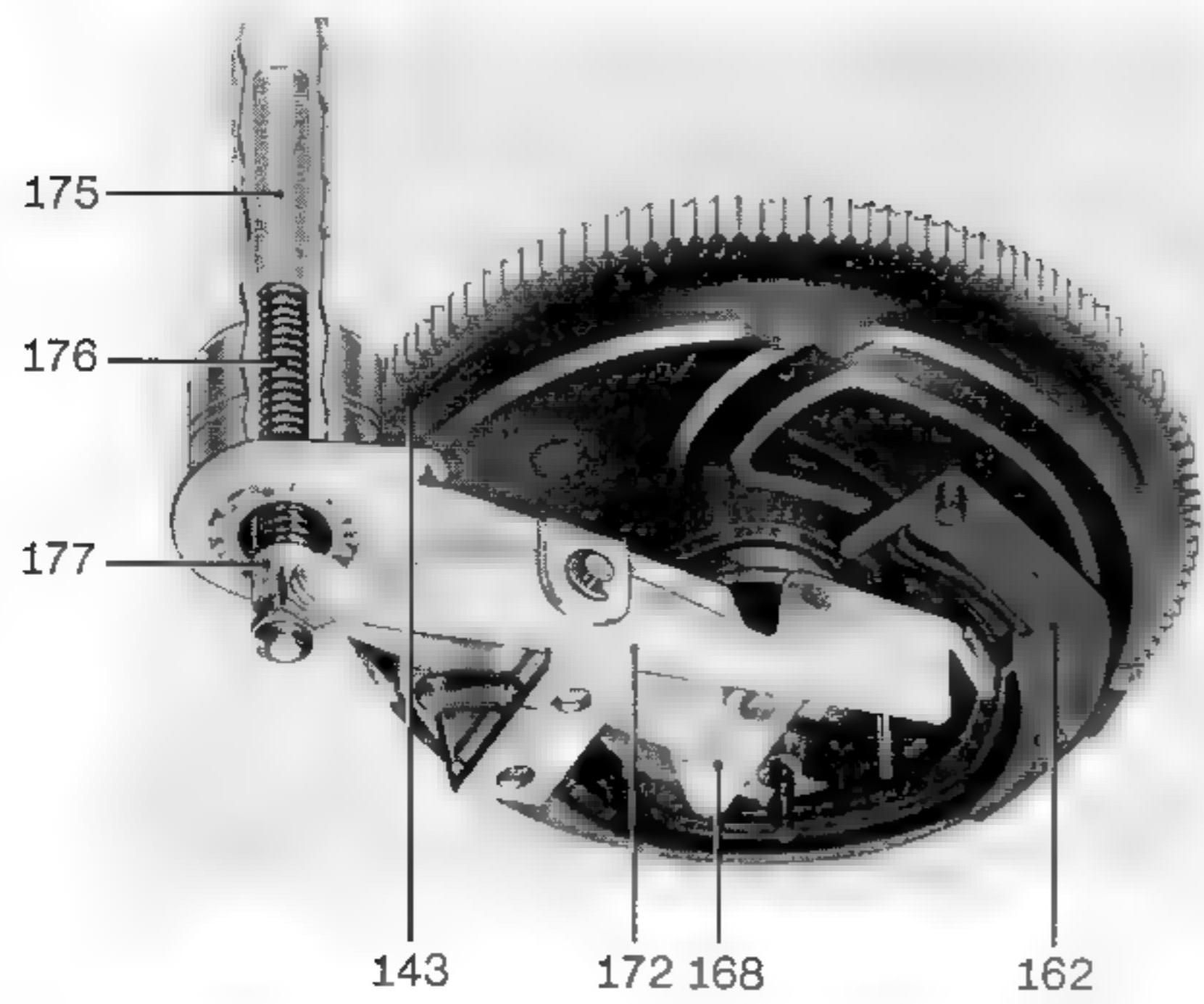


Fig. 18

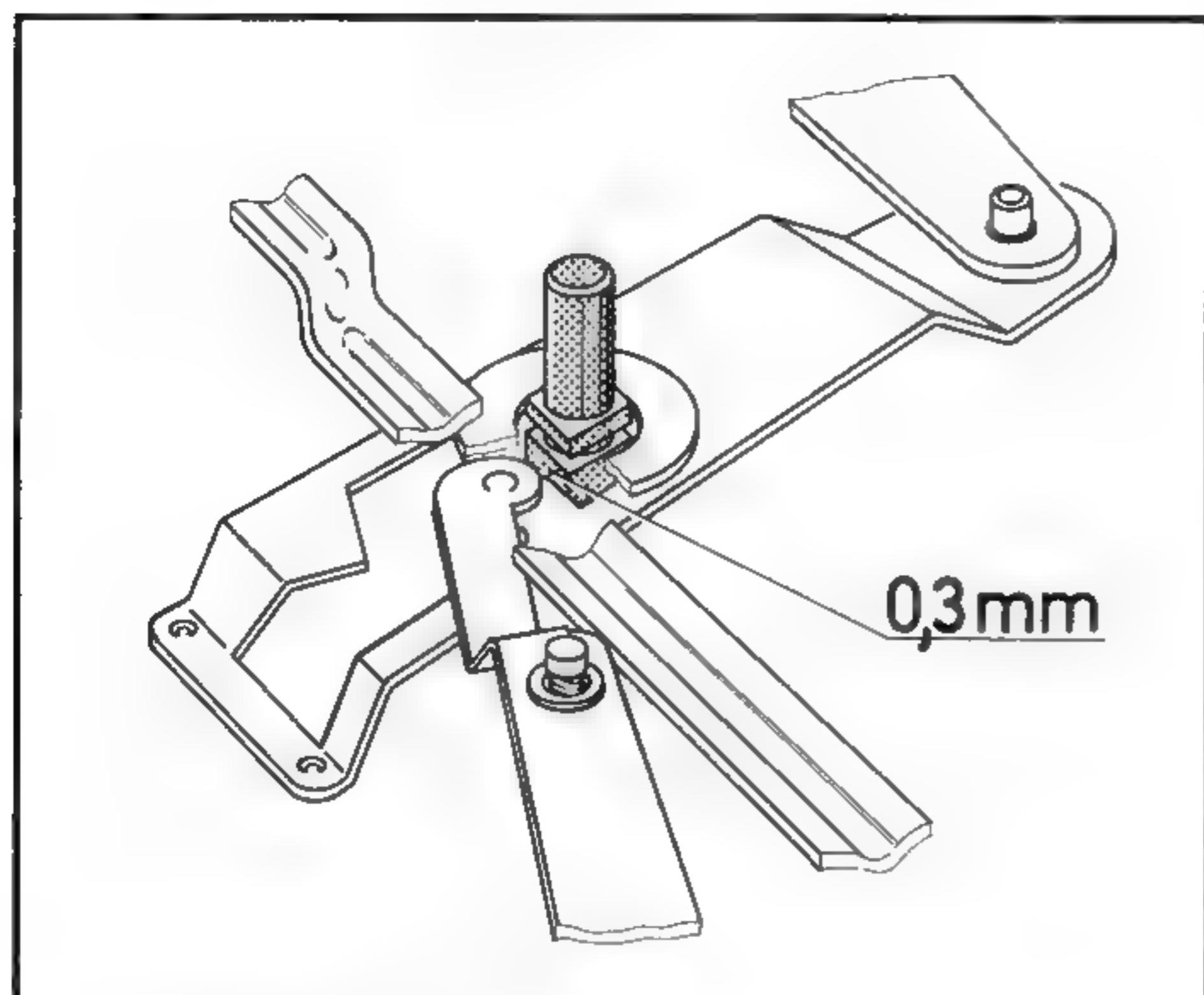
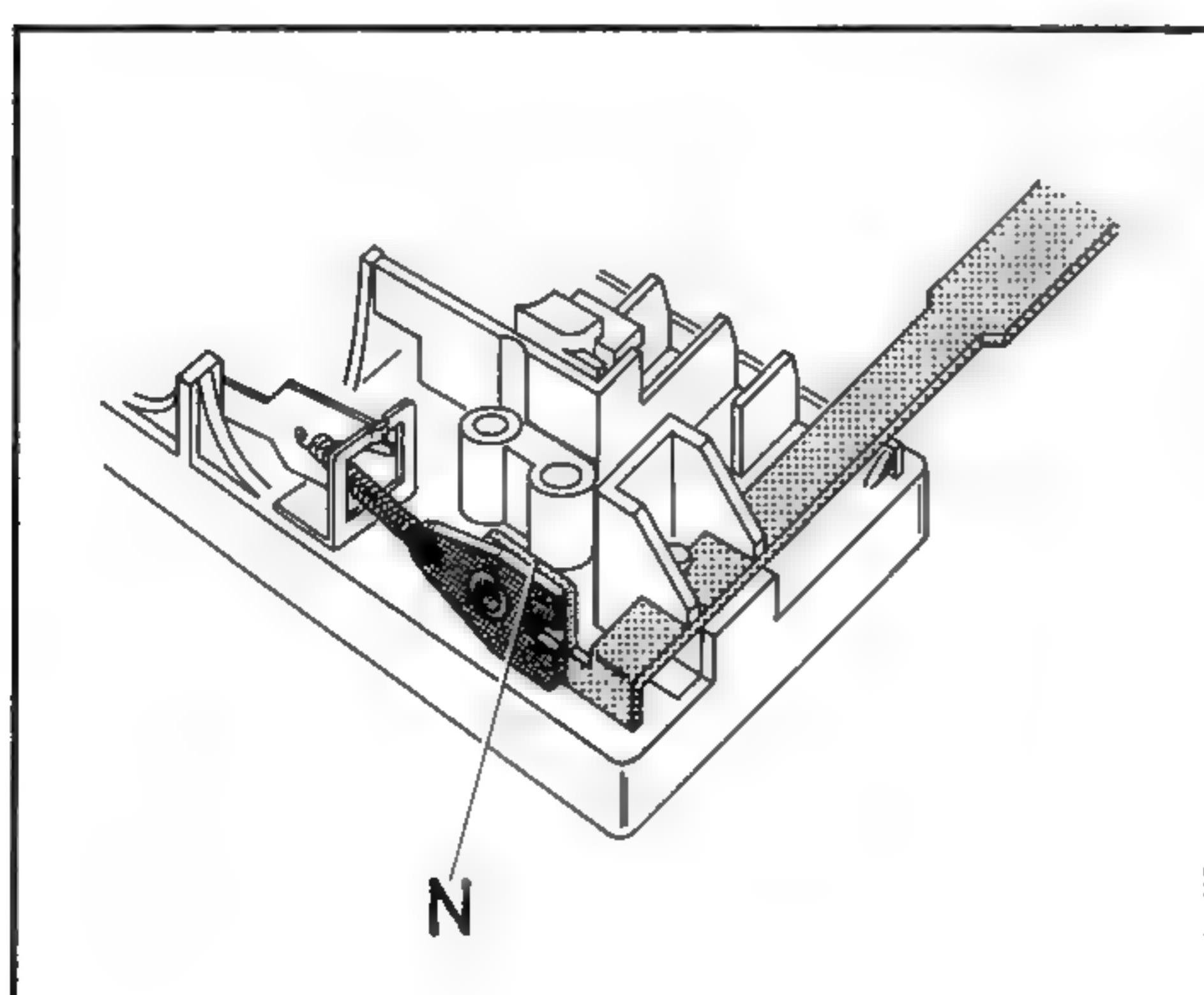


Fig. 19



Shut-off mechanism

Shut-off and change functions are determined by the position of the cam follower lever (162). After every start or record-drop, the cam follower lever is brought to its stop position by the main lever (212) (longer end towards the center of the main cam). As the record is dropped the cam follower lever (162) is turned to its start position by the cam rocker (172), so that the tonearm can swing in toward the record and be lowered on to it. If there are no more records on the spindle, and the cam rocker cannot turn the cam follower lever, the lever remains in its stop position and allows the tonearm to swing to its rest position.

When the main cam (143) returns to its neutral position, the switch arm (252) drops into a cut-out in the main cam, opening the power switch (163) and disengaging the drive idler (139).

Symptom

Turntable stops after automatic setdown of the tonearm

Cause

- Switch arm (252) is not latched by pawl (243)
- Power switch opens

Remedy

- Loosen screw and turn the short arm piece on the long switch-arm piece. Move the tonearm in and turn the main cam to its neutral position and adjust for about $1/64"$ play between cam and rectangular bolts riveted into the chassis.
- As the tonearm moves in, switch slide (153) must overtravel by about $1/64"$. Its tab must engage the switch.

Symptom

Last record keeps repeating

Cause

Defective spindle

Remedy

Replace spindle

Symptom

Record does not drop when unit is switched to "start"

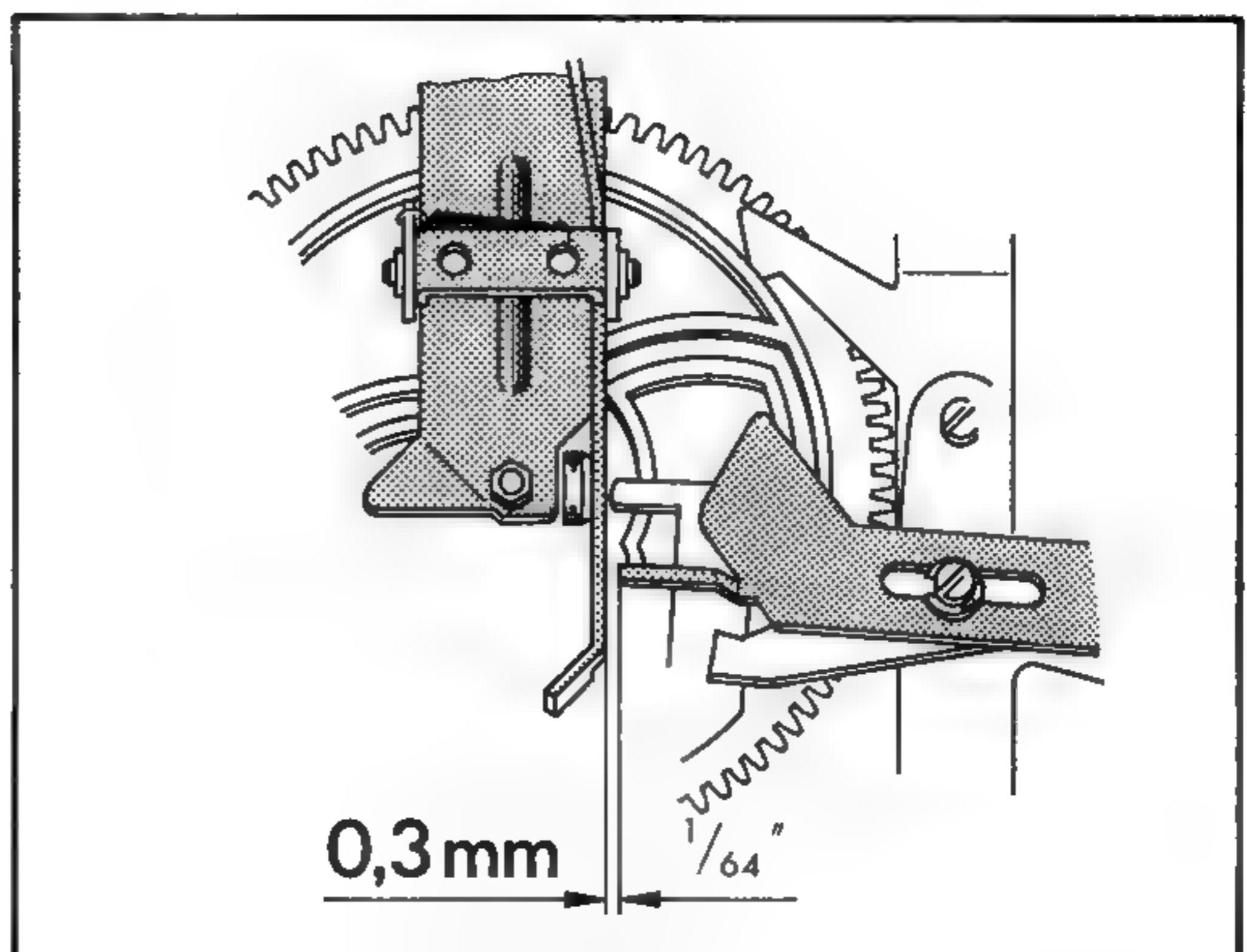
Cause

Inadequate engagement between change lever and cam rocker (172)

Remedy

Adjust clearance between change lever and cam rocker to $1/64"$ minimum with apparatus in "start" position.

Fig. 20



Symptom

Record drops when unit is switched to "stop"

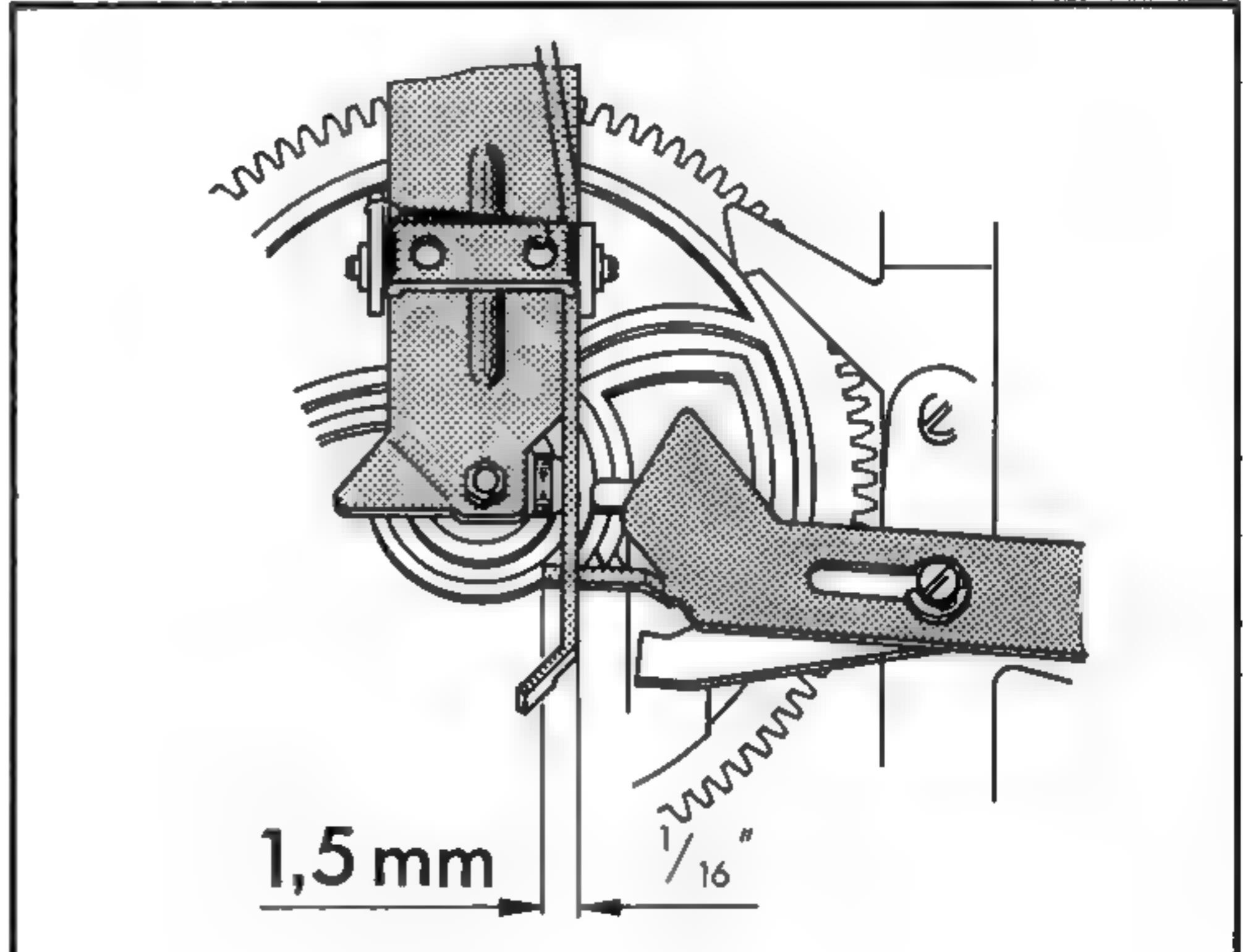
Cause

Cam rocker (172) not caught by start lever

Remedy

Adjust cam rocker so that at the conclusion of the "stop" function the start lever runs about $1/16"$ under the follower.

Fig. 21



Symptom

Records do not drop

Cause

Cam rocker (172) has too little force (travel)

Remedy

Re-adjust eccentric so that when the three supports in the automatic spindle are held in and the main cam is at its neutral, pressing the change screw moves the support about $1/64"$.

Fig. 22

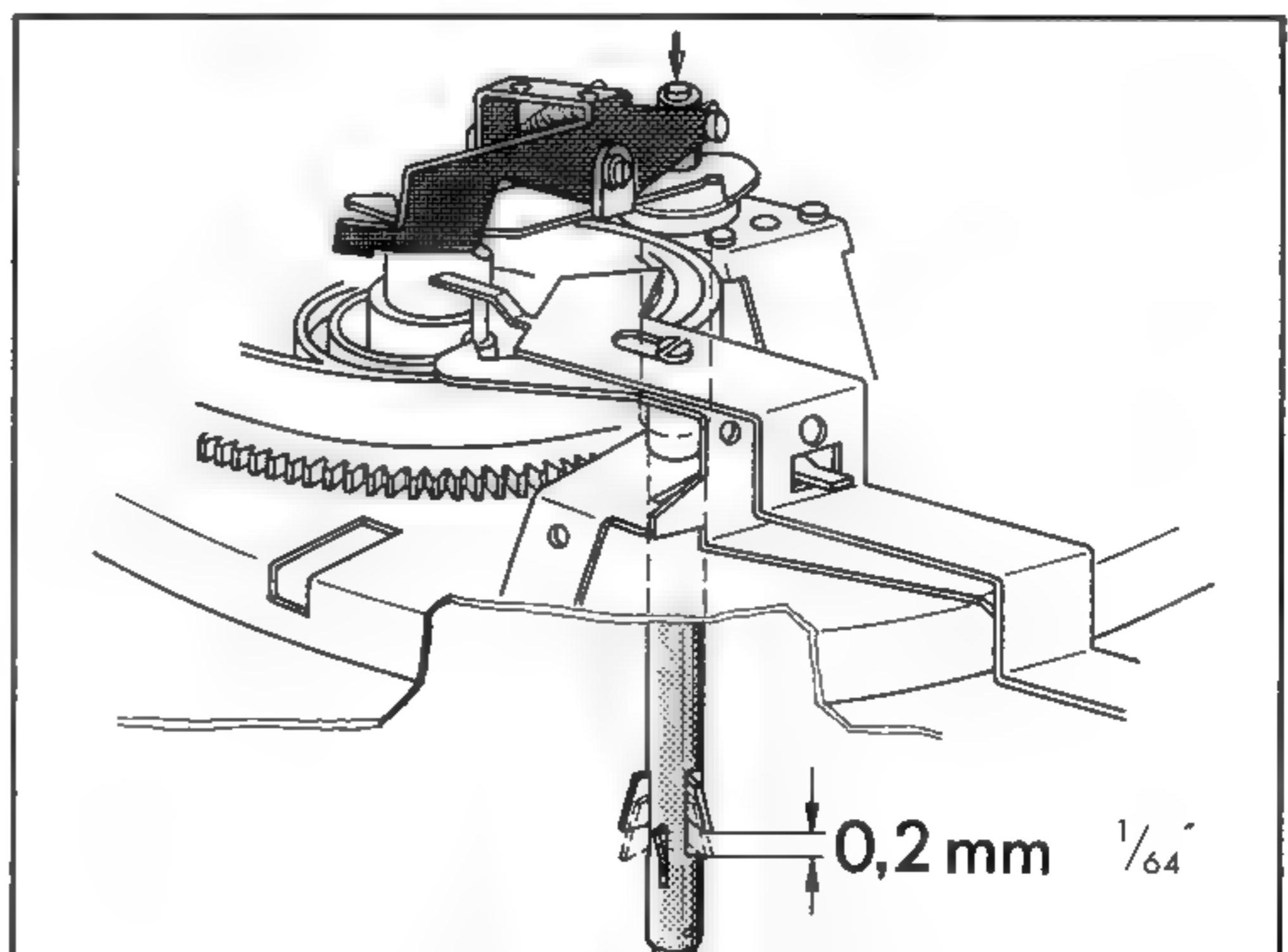
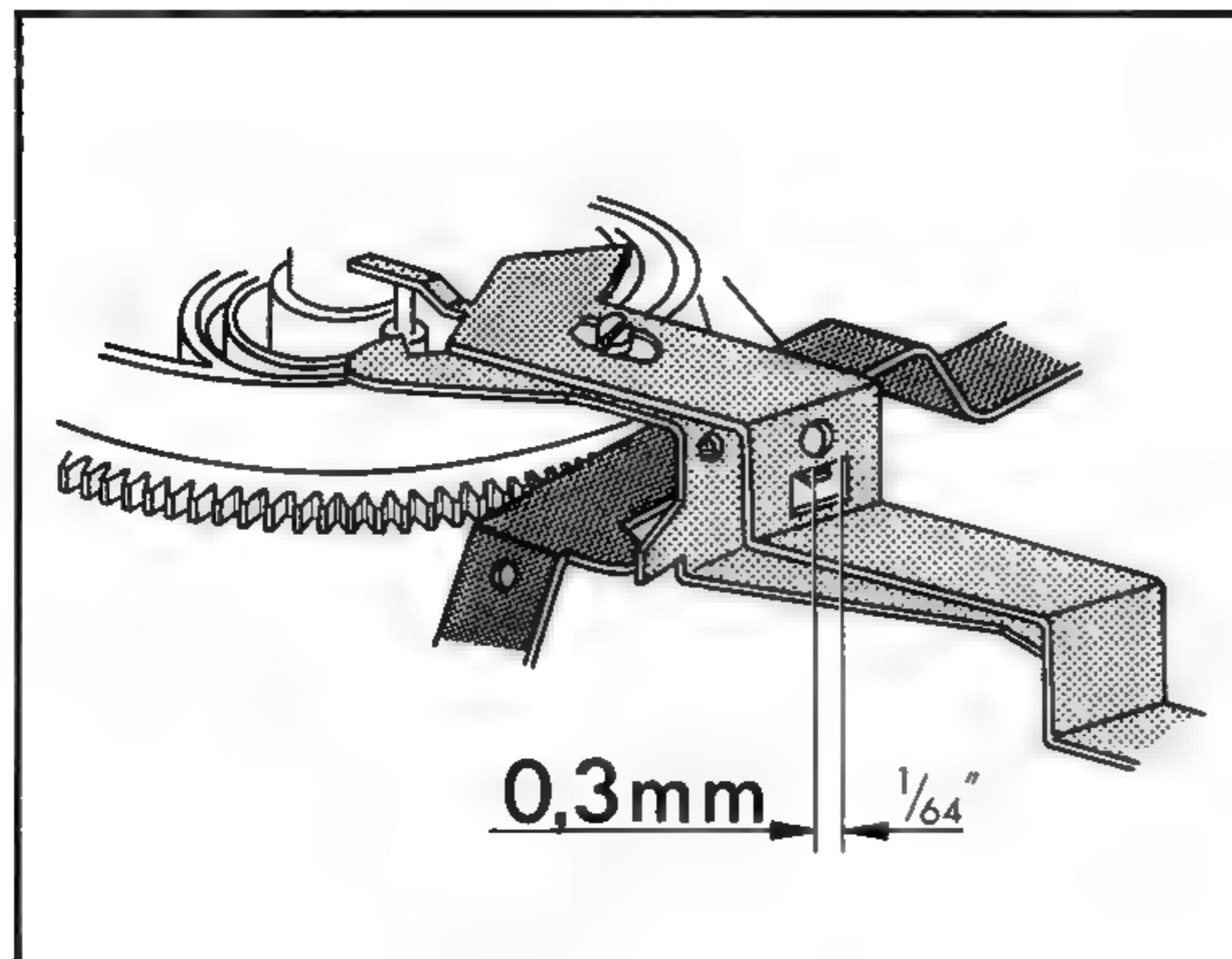


Fig. 23



Symptom

Switch latches into "stop" position when tonearm is at rest.

Cause

Too much clearance between tab on switch arm (252) and start lever (256).

Remedy

Adjust tab on switch arm so that it clears start lever by 1/64" when main cam is in neutral position.

| Symptom | Cause | Remedy |
|--|---|---|
| Tonearm moves with stylus force and anti-skating force at zero: a) outward; b) inward | a) Anti-skating out of adjustment b) Too-taut tonearm leads produce a twisting force | a) Adjust skating lever so that horizontal movement of tonearm causes no movement of anti-skating spring. b) Allow some slack in tonearm leads |
| During change, stop and start operations, noises from the mechanism can be heard in system speaker | Muting switch misadjusted. Distance between contact springs and shorting contact is too great | Bend contacts so that, in the neutral position of the main cam the spacing between contacts is about 0,02 inch. Clean contacts. |
| No sound | Spacing too small | See above |
| Motor will not shut off when tonearm is on arm rest | Capacitor across power switch is shorted | Replace capacitor (0.1µF, 700 V) |
| Acoustic feedback | a) Chassis parts (for example leads) are touching base cut-out b) Connecting cables are too taut | a) Correct cut-out according to instructions supplied with unit. Move cables. b) Allow more slack in cables |

Symptom

Tonearm is hindered in its horizontal motion during change cycle.

Cause

Positioning socket or positioning screw misadjusted.

Remedy

Move tonearm over operating lever (45) and turn the positioning socket (65) until the clearance between stylus tip and operating lever is approximately 2-3 mm. (Fig. 24).

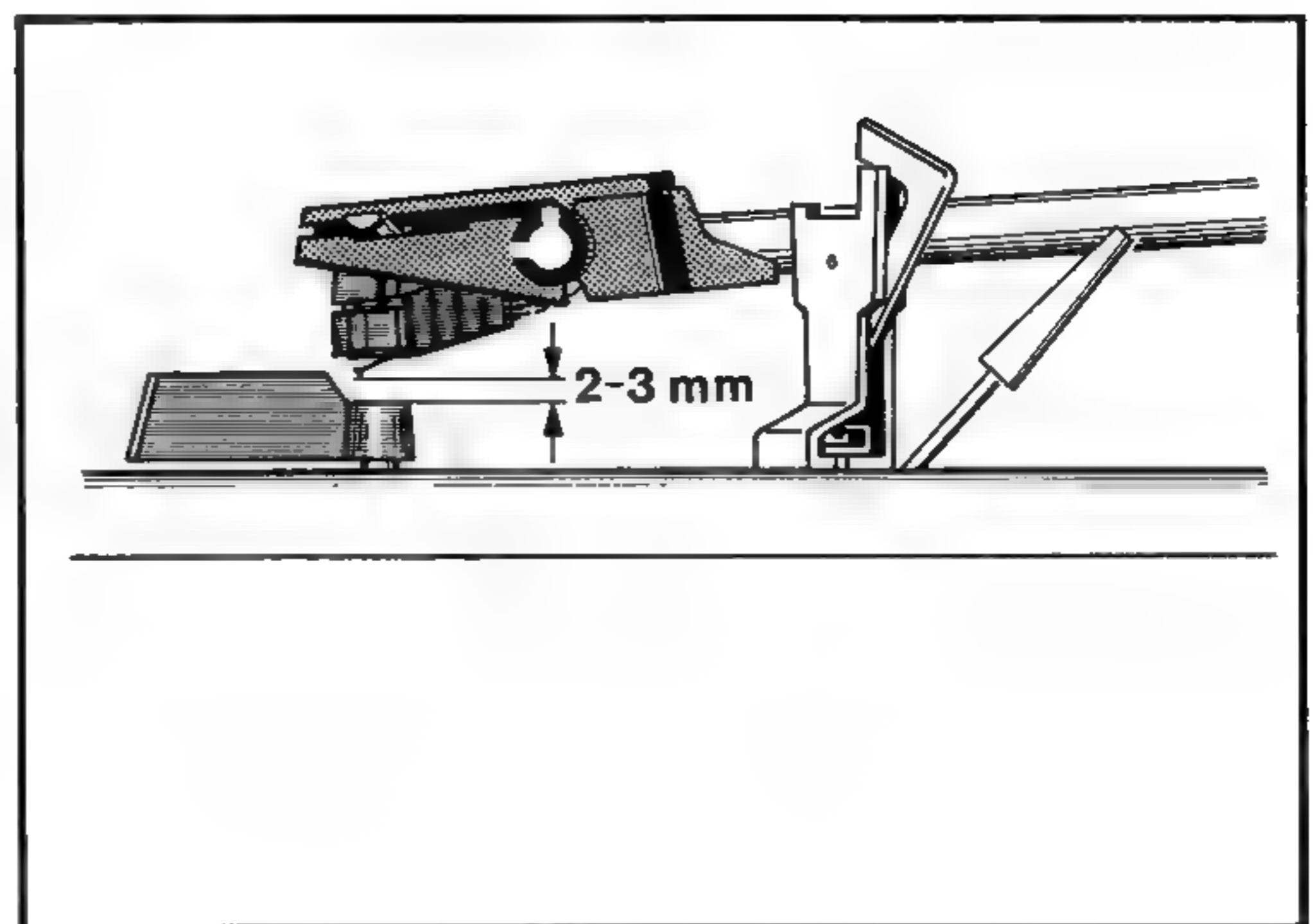
Rotate cam (143) away from its neutral position until main lever (212) lifts the tonearm completely.

Swing the tonearm over its rest and adjust nut (55) so that between pim-pel (63) and the resting surface of the tonearm there is a play of approximately 0.1 mm. (0.5 mm measured at tonearm head.)

Caution

This play must be maintained over the entire horizontal swing.

Fig. 24



Symptom

Tonearm head is not parallel to turntable platter

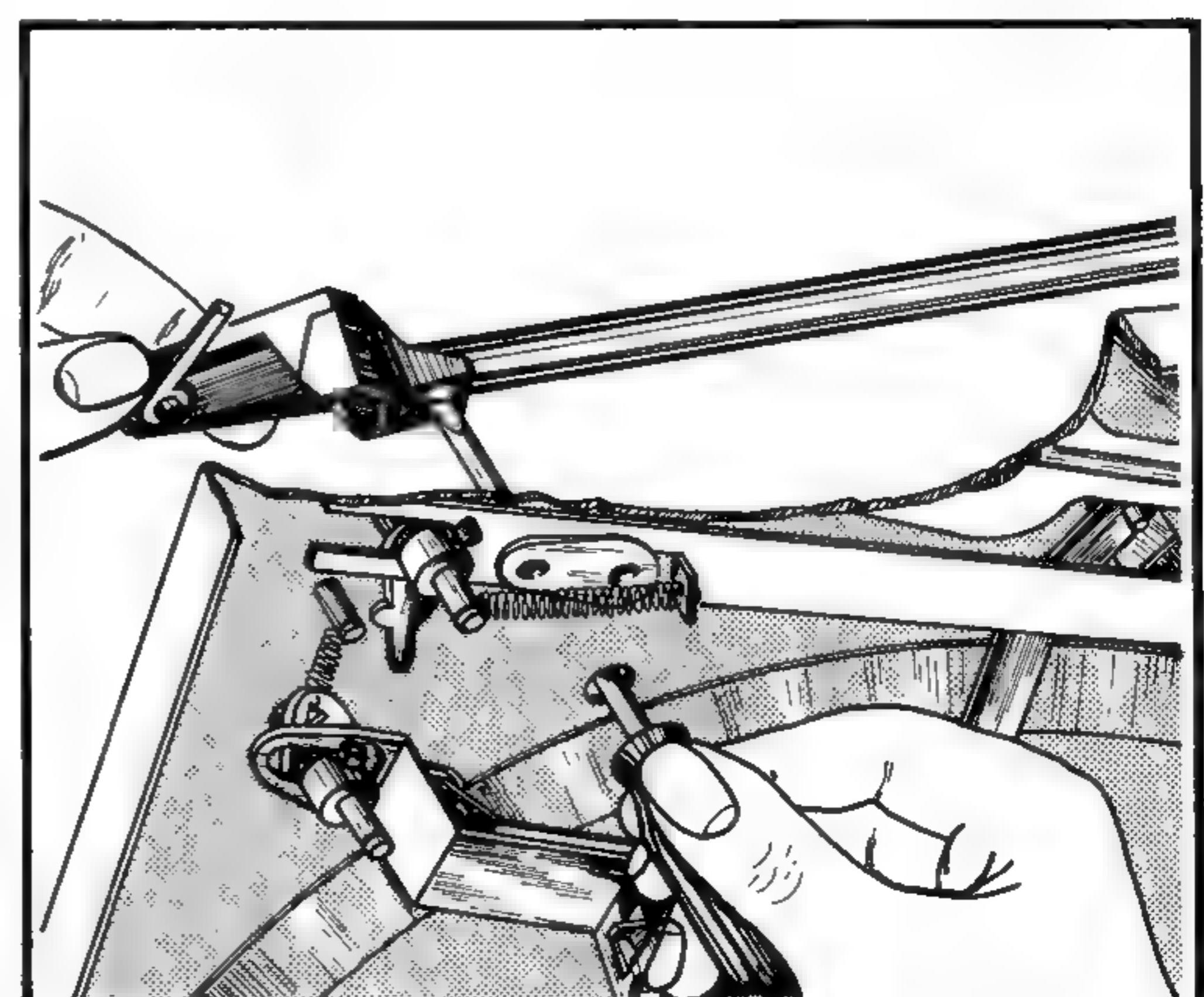
Cause

Orientation of tonearm head on tonearm tube has altered because of jolting in transport (shipping).

Remedy

Remove turntable platter with the help of a screwdriver inserted through the hole in the chassis placed there for the purpose. Loosen screw on tonearm head. After correcting the tonearm head, tighten screw. (Fig. 25)

Fig. 25



Replacement parts

| Ref. No. | Part. No. | Description | Quantity |
|----------|-----------|--|----------|
| 1 | 215 470 | Automatic spindle AS 12 | 1 |
| 2 | 213 895 | Changing spindle AW 3 | 1 |
| 3 | 214 056 | Washer | 1 |
| 4 | 200 543 | Retaining ring | 1 |
| 5 | 201 208 | Facing ring 230 mm Ø | 1 |
| 6 | 218 385 | Turntable mat complete, with facing ring 230 mm Ø | 1 |
| 7 | 218 388 | Turntable complete, with mat and facing ring 230 mm Ø | 1 |
| 8 | 221 725 | Speed change lever, left, complete | 1 |
| 9 | 217 241 | Pitch control knob complete | 1 |
| 10 | 223 047 | Blind (cm) | 1 |
| | 223 048 | Blind (inch) | 1 |
| 11 | 223 045 | Chassis complete | 1 |
| 12 | 214 210 | Shipping screw assembly | 2 |
| 13 | 220 213 | Centering disc | 1 |
| 14 | 201 101 | Centering pin | 1 |
| 15 | | Tonearm assembly (only available complete as pos. no. 16, 42-43 and 50-60) | |
| 16 | 223 055 | Tonearm complete | 1 |
| 17 | 223 046 | Tonearm head complete | 1 |
| 18 | 201 132 | Lift | 1 |
| 19 | 210 182 | Bowed lockwasher | 1 |
| 20 | 210 630 | Washer 4.2/8/0.5 St | 1 |
| 21 | 210 197 | Grip ring G 4 x 0.8 | 1 |
| 22 | 223 036 | Cartridge mount TK 15 | 1 |
| 23 | 223 011 | Tonearm rest complete | 1 |
| 24 | 210 362 | Hex nut BM 3 | 2 |
| 25 | 210 816 | Machine screw M 4 x 4 | 1 |
| 26 | 217 374 | Centering screw | 1 |
| 27 | 210 366 | Hex nut BM 4 | 9 |
| 28 | 210 362 | Hex nut BM 3 | 2 |
| 29 | 200 579 | Spring mounted footing complete (1 set = 3 pieces) | 1 |
| 30 | 200 721 | Bushing isolation mount | 3 |
| 31 | 200 728 | Compression spring isolation mount | 3 |
| 32 | 200 723 | Rubber insert isolation mount | 3 |
| 33 | 200 722 | Steel cup | 3 |
| 34 | 210 366 | Hex nut BM 4 | 9 |
| 35 | 201 632 | Rubber washer | 2 |
| 36 | 200 713 | Washer | 2 |
| 37 | 200 712 | Spring cup | 2 |
| 38 | 200 711 | Lockwasher | 2 |
| | 210 366 | Hex nut BM 4 | 4 |
| 39 | 210 624 | Washer 4.2/7/0.3 St | 4 |
| 40 | 200 718 | Compression spring | 2 |
| 41 | 210 624 | Washer 4.2/7/0.3 St | 4 |
| 42 | 216 831 | Stop nut | 1 |
| 43 | 216 830 | Threaded rod, short | 1 |
| 44 | 214 217 | Contact plate complete | 1 |
| 45 | 221 726 | Switch lever, right, complete | 2 |
| 46 | 221 726 | Switch lever, right, complete | 2 |
| 47 | 216 881 | Arm lift lever, complete | 1 |
| 48 | 210 353 | Hex nut BM 2 | 1 |
| 49 | 210 143 | "C" washer 1.5 | 3 |
| 50 | 223 054 | Weight complete | 1 |
| 51 | 221 581 | Spindle for weight | 1 |
| 52 | 216 545 | Securing screw | 1 |
| 53 | 218 297 | Spring barrel complete | 1 |
| 54 | 223 044 | Bearing ring complete | 1 |
| 55 | 221 558 | Stop nut | 1 |
| 56 | 216 829 | Bearing screw | 1 |
| 57 | 216 834 | Locknut, high | 1 |
| 58 | 221 486 | Threaded rod, long | 1 |
| 59 | 223 043 | Ring complete | 1 |
| 60 | 210 187 | Bowed lockwasher | 2 |
| 61 | 210 658 | Washer 5.1/10/1 | 2 |
| 62 | 210 147 | "C" washer 4.0 | 4 |
| 63 | 216 844 | Shaft pin | 2 |
| 64 | 210 143 | "C" washer 1.5 | 3 |
| 65 | 218 318 | Set housing | 1 |
| 66 | 220 898 | Knob | 1 |
| 67 | 223 052 | Dress plate complete | 1 |
| 68 | 213 260 | Pin 2 x 6 | 4 |
| 69 | 217 905 | Damping piece | 1 |
| 70 | 214 047 | Special screw (pierced) | 2 |
| | 214 211 | Special screw (threaded) | 2 |

Fig. 26 Exploded view, parts below chassis

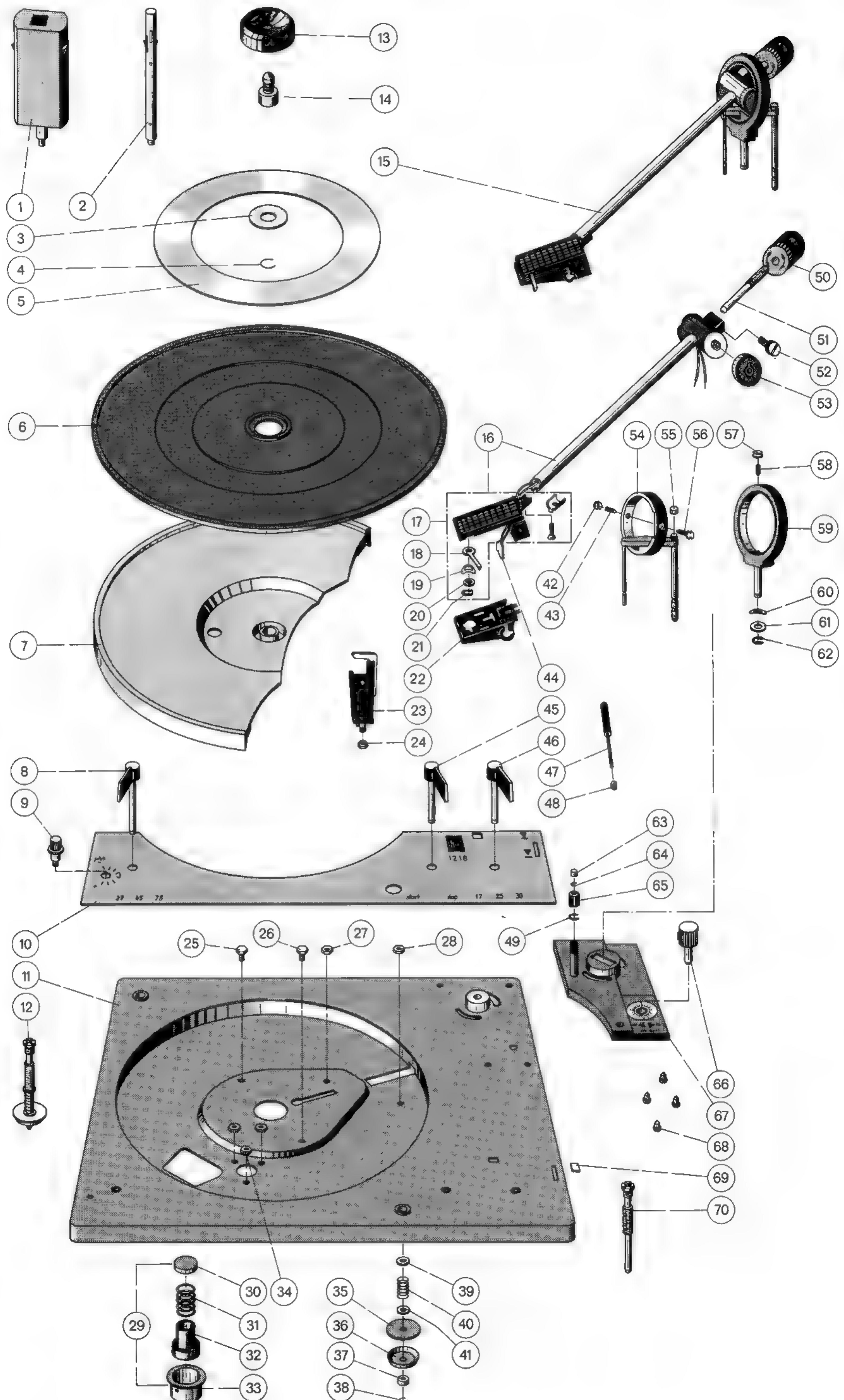
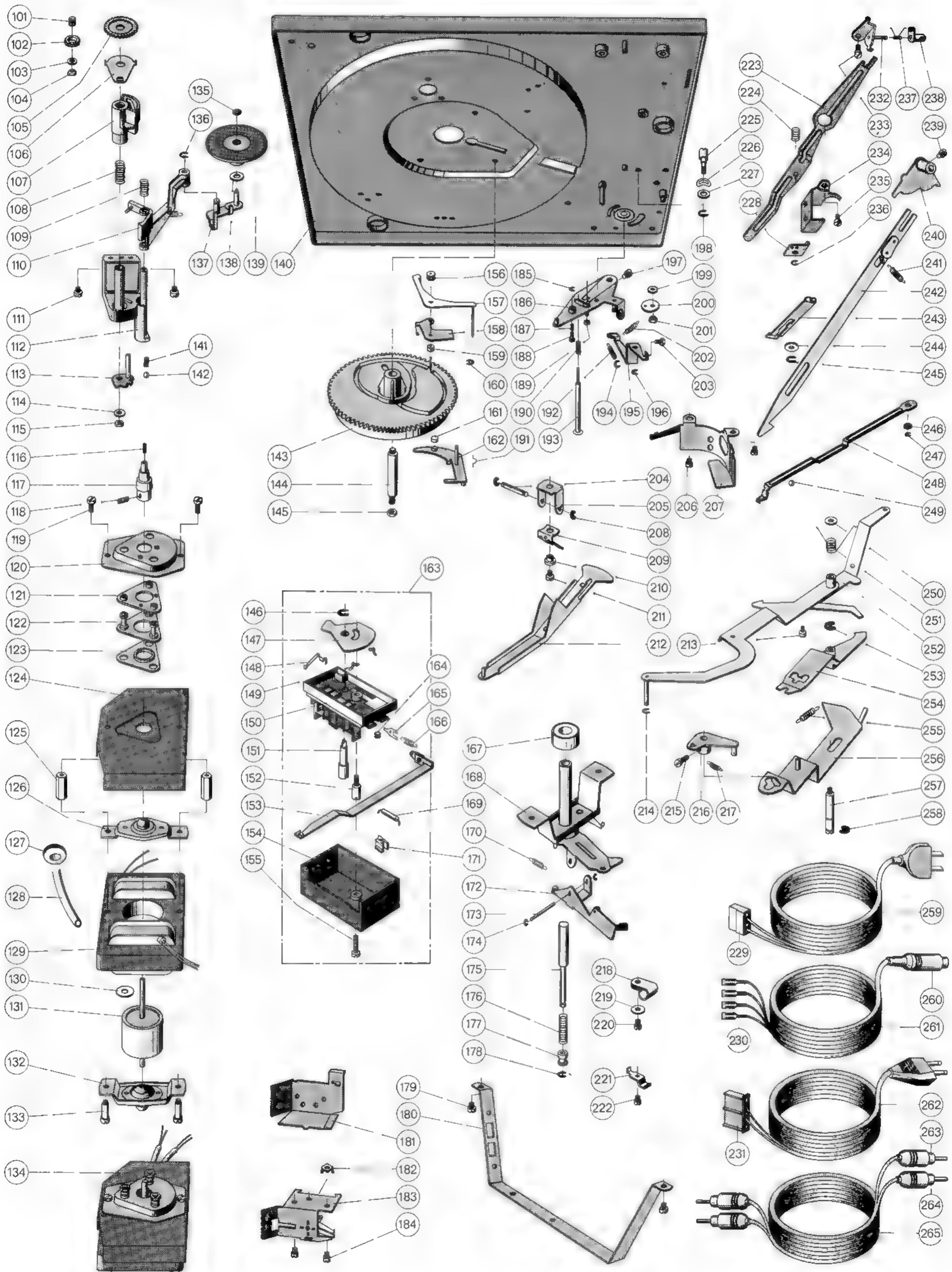


Fig. 27 Exploded view, parts above chassis



| Ref. No. | Part. No. | Description | Quan-tity |
|----------|-----------|---|-----------|
| 101 | 217 376 | Compression spring | 1 |
| 102 | 217 026 | Cam wheel | 1 |
| 103 | 210 586 | Washer 3.2/7/0.5 St | 3 |
| 104 | 210 361 | Hex nut M 3 | 3 |
| 105 | 217 027 | Speed regulator wheel | 1 |
| 106 | 217 233 | Speed regulator detent | 1 |
| 107 | 217 028 | Switching segment | 1 |
| 108 | 216 736 | Compression spring | 1 |
| 109 | 216 737 | Compression spring | 1 |
| 110 | 217 234 | Idler arm complete | 1 |
| 111 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 112 | 216 558 | Support complete | 1 |
| 113 | 217 239 | Groove detent complete | 1 |
| 114 | 210 642 | Washer 4.2/10/1.5 St | 4 |
| 115 | 210 361 | Hex nut M 3 | 3 |
| 116 | 217 751 | Threaded pin M 2.6 x 8 | 1 |
| 117 | 218 273 | Motor pulley 50 Hz complete | 1 |
| | 218 274 | Motor pulley 60 Hz complete | 1 |
| 118 | 210 220 | Threaded pin M 2.6 x 3.5 | 1 |
| 119 | 210 509 | Machine screw AM 3.5 x 8 | 2 |
| 120 | 204 669 | Dress-up plate | 1 |
| 121 | 204 668 | Isolation mount plate | 1 |
| 122 | 222 306 | Mounting bracket complete | 1 |
| 123 | 222 283 | Isolation washer lower | 1 |
| 124 | 204 665 | Motor shield | 1 |
| 125 | 200 167 | Motor spacer | 2 |
| 126 | 215 843 | Motor bearing top complete | 1 |
| 127 | 209 939 | Sleeving | 1 |
| 128 | 217 727 | Insulating sleeve | 1 |
| 129 | 218 386 | Stator 110/220 V complete | 1 |
| | 220 184 | Stator 150 V complete | 1 |
| 130 | 215 839 | Protecting washer | 1 |
| 131 | 218 389 | Rotor complete | 1 |
| 132 | 215 840 | Motor bearing lower complete | 1 |
| 133 | 215 848 | Screw bolt | 2 |
| 134 | 223 049 | Motor 110/220 V complete | 1 |
| | 223 050 | Motor 150 V complete | 1 |
| 135 | 200 633 | Lockwasher | 1 |
| 136 | 210 146 | "C" washer 3.2 | 3 |
| 137 | 217 244 | Idler arm complete | 1 |
| 138 | 200 110 | Washer | 1 |
| 139 | 217 888 | Idler wheel complete | 1 |
| 140 | 223 045 | Chassis complete | 1 |
| 141 | 218 629 | Compression spring | 1 |
| 142 | 209 358 | Steel ball 4 mm Ø | 2 |
| 143 | 220 332 | Cam wheel complete | 1 |
| 144 | 200 519 | Bearing post for cam wheel | 1 |
| 145 | 210 366 | Hex nut BM 4 | 9 |
| 146 | 210 196 | "C" clip G 3 x 0.6 | 1 |
| 147 | 214 174 | Contact support | 1 |
| 148 | 214 176 | Screen spring | 1 |
| 149 | 214 175 | Contact spring | 2 |
| 150 | 217 060 | Switch plate complete with voltage selector | 1 |
| | 214 206 | Switch plate complete less voltage selector | 1 |
| | 223 006 | Switch plate complete with SEMKO capacitor and voltage selector | 1 |
| 151 | 214 173 | Speed spindle | 1 |
| 152 | 214 181 | Screw bolt | 1 |
| 153 | 213 970 | Switch slide complete | 1 |
| 154 | 217 062 | Switch cover with voltage selector | 1 |
| | 214 207 | Switch cover less voltage selector | 1 |
| | 223 007 | Switch cover with voltage selector and SEMKO capacitor | 1 |
| 155 | 210 492 | Machine screw AM 3 x 15 | 1 |
| 156 | 220 235 | Stop nut | 1 |
| 157 | 220 232 | Shut-off lever complete | 1 |
| 158 | 222 690 | Friction plate complete | 1 |
| 159 | 221 935 | Bushing | 1 |
| 160 | 210 145 | "C" washer 2.3 | 9 |
| 161 | 200 650 | Sleeve | 1 |
| 162 | 214 203 | Cam follower lever complete with sleeve | 1 |
| 163 | 217 059 | Power switch complete with voltage selector | 1 |
| | 214 205 | Power switch complete less voltage selector | 1 |
| | 222 997 | Power switch complete with voltage selector and SEMKO capacitor | 1 |

| Ref. No. | Part. No. | Description | Quantity |
|----------|-----------|---|----------|
| 164 | 218 986 | Roller for switch slide | 1 |
| 165 | 213 966 | Snap spring | 1 |
| 166 | 213 968 | Tension spring | 1 |
| 167 | 200 554 | Ball bearing complete | 1 |
| 168 | 214 201 | Bearing support complete | 1 |
| 169 | 203 725 | Capacitor | 1 |
| 170 | 221 186 | SEMKO capacitor | 1 |
| 171 | 213 925 | Tension spring | 1 |
| 172 | 213 978 | Locking device, small, for power switch housing | 1 |
| 173 | 213 979 | Locking device, large, for power switch housing | 1 |
| 174 | 213 922 | Cam rocker complete | 1 |
| 175 | 217 813 | Spindle | 1 |
| 176 | 210 145 | "C" washer 2.3 | 9 |
| 177 | 213 918 | Change actuator | 1 |
| 178 | 213 920 | Compression spring | 1 |
| 179 | 213 921 | Bushing | 1 |
| 180 | 210 145 | "C" washer 2.3 | 9 |
| 181 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 182 | 217 617 | Stand | 1 |
| 183 | 217 759 | Stand complete with phono jacks | 1 |
| 184 | 201 240 | Shield | 1 |
| 185 | 211 614 | Solder lug | 1 |
| 186 | 207 447 | Muting switch complete | 1 |
| 187 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 188 | 210 143 | "C" washer 1.5 | 3 |
| 189 | 223 041 | Segment complete | 1 |
| 190 | 201 174 | Tension spring | 1 |
| 191 | 200 686 | Spring pin | 1 |
| 192 | 216 844 | Pin' | 2 |
| 193 | 216 853 | Tension spring | 1 |
| 194 | 200 522 | Snap spring | 1 |
| 195 | 218 591 | Tension spring | 1 |
| 196 | 221 571 | Lift rod complete | 1 |
| 197 | 201 184 | Set washer | 1 |
| 198 | 222 691 | Skating lever complete | 1 |
| 199 | 210 146 | "C" washer 3.2 | 3 |
| 200 | 210 469 | Machine screw AM 3 x 3 | 3 |
| 201 | 210 147 | "C" washer 4.0 | 4 |
| 202 | 210 147 | Bowed lockwasher | 1 |
| 203 | 210 867 | Cam washer | 1 |
| 204 | 220 899 | Hex nut M 3 | 3 |
| 205 | 210 361 | Tension spring | 1 |
| 206 | 217 948 | Set screw | 1 |
| 207 | 221 260 | Spindle | 1 |
| 208 | 200 528 | Main lever bracket | 1 |
| 209 | 201 186 | Machine screw AM 3 x 5 | 10 |
| 210 | 210 475 | Cover plate | 1 |
| 211 | 201 285 | "C" washer 2.3 | 9 |
| 212 | 210 145 | Leaf spring | 1 |
| 213 | 201 186 | Main lever complete | 1 |
| 214 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 215 | 210 245 | "C" washer 2.3 | 9 |
| 216 | 218 583 | Machine screw M 3 x 4 | 2 |
| 217 | 216 773 | Selector lever complete | 1 |
| 218 | 216 777 | Tension spring | 1 |
| 219 | 220 152 | Plastic clamp | 1 |
| 220 | 210 586 | Washer 3.2/7/0.5 | 3 |
| 221 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 222 | 200 447 | Cable clamp | 1 |
| 223 | 210 475 | Machine screw AM 3 x 5 | 10 |
| 224 | 221 576 | Connecting lever | 1 |
| 225 | 221 577 | Tension spring | 1 |
| 226 | 221 559 | Set screw | 1 |
| 227 | 210 187 | Bowed lockwasher | 2 |
| 228 | 210 658 | Washer 5.1/10/1 St | 2 |
| 229 | 221 578 | Guide piece | 1 |
| 230 | 209 457 | Inner casing for AMP plug | 1 |
| 231 | 209 436 | Flat prong plug | 4 |
| 232 | 213 980 | Input jack housing | 1 |
| 233 | 221 574 | Connecting lever bracket complete | 1 |
| | 210 469 | Machine screw AM 3 x 3 | 3 |

| Ref. No. | Part. No. | Description | Quan-tity |
|----------|-----------|---|-----------|
| 234 | 221 623 | Stopper | 1 |
| 235 | 210 511 | Machine screw AM 4 x 4 | 1 |
| 236 | 210 145 | "C" washer 2.3 | 9 |
| 237 | 217 296 | Torsion spring | 1 |
| 238 | 220 790 | Drive cam | 1 |
| 239 | 218 583 | Machine screw M 3 x 4 | 2 |
| 240 | 217 264 | Selector lever complete | 1 |
| 241 | 200 453 | Tension spring | 1 |
| 242 | 217 276 | Arm positioning slide complete | 1 |
| 243 | 213 942 | Latch complete | 1 |
| 244 | 202 043 | Washer 5.8/12/0.5 St | 2 |
| 245 | 210 146 | "C" washer 3.2 | 3 |
| 246 | 201 187 | Friction disc | 1 |
| 247 | 210 145 | "C" washer 2.3 | 9 |
| 248 | 200 688 | Shut-off lever | 1 |
| 249 | 209 358 | Steel ball 4 mm Ø | 2 |
| 250 | 210 586 | Washer 3.2/7/0.5 St | 3 |
| 251 | 213 940 | Torsion spring | 1 |
| 252 | 217 889 | Switch arm complete | 1 |
| 253 | 210 147 | "C" washer 4.0 | 4 |
| 254 | 218 538 | Switch lever complete | 1 |
| 255 | 200 103 | Torsion spring | 1 |
| 256 | 217 258 | Start lever complete | 1 |
| 257 | 217 334 | Grooved shaft | 1 |
| 258 | 210 147 | "C" washer 4.0 | 4 |
| 259 | 213 984 | Power cord with ground connection (U.S. type plug) | 1 |
| 260 | 209 424 | Miniatur plug (U. S. type plug) for audio cable | 1 |
| 261 | 207 303 | Audio cable complete with miniatur plugs (U.S. type plug) | 1 |
| 262 | 220 142 | Power cord complete | 1 |
| 263 | 209 425 | Phono plug (RCA type plug) yellow | 2 |
| 264 | 209 426 | Phono plug (RCA type plug) red | 2 |
| 265 | 207 299 | Audio cable, complete, with phono plugs (RCA type plugs) | 1 |
| ** | 201 229 | Cover pin | 1 |
| ** | 214 210 | Hardware for cartridge mounting | 1 |
| ** | 211 473 | Stroboscope disc 50/60 Hz | 1 |
| ** | 214 219 | Packing carton, complete | 1 |
| ** | 222 332 | Operating instructions in 4 languages | 1 |
| ** | 222 660 | Operating instructions UAP | 1 |
| ** | 222 685 | Operating instructions english | 1 |
| ** | 222 330 | Mounting instructions | 1 |

Alteration reserved

** Not illustrated

Lubrication

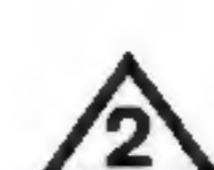
All bearings and sliding points have been properly lubricated during assembly. Re-lubrication is normally not necessary for about two years since all important bearings are provided with oil retainers and sintered bearings.

Lubrication should be applied sparingly. It is of primary importance that no oil or grease should get onto the friction surfaces of the drive wheel, motor pulley or turntable, to avoid slippage. For the same reason, avoid touching these parts.

Use the following lubricants:



Wacker siliconoil
AK 300 000



Adhesive oil,
Renotac No. 342



BP oil, Super Viskostatic
10 W/ 30



Shell Alvania No. 2



Isoflex PDP 40

Fig. 28 Chassis, viewed from above



Fig. 29 Chassis, viewed from below

